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ABSTRACT

The dissertation abstracts in this compilation all appeared in "Dissertation Abstracts International" in 1983. The 300 dissertations cited in the annual listing of research in the July 1984 issue of the "Journal for Research in Mathematics Education" are included, as well as 55 dissertations which were located but could not be included in that issue. The abstracts are arranged alphabetically by author. A subject index (with dissertations arranged by author and school level within each subject area) is provided. Among the subject areas are: achievement; achievement related to intelligence; adult basic education; algebra; anxiety; attitudes; business mathematics; calculators; cognitive style; computers; content organization; counting and place value; decimals; drill and practice; enrichment; error analysis; estimation; fractions; geometry; grouping; historical developments; international comparisons; language, readability, and vocabulary; learning disabilities; logic and proof; low achievers; manipulative and other materials; measurement; nationality and race; parental background; physical, psychological, and/or social factors; Piagetian concepts; probability and statistics; problem-solving; remediation; sex differences; teaching methods; teacher education; test analysis; testing; textbooks; thought processes; time allotment; tutoring; and whole number computation (addition, subtraction, multiplication, and division). Information on ordering the dissertations is also provided. (JN)

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# Dissertation Abstracts in Mathematics Education, 1983

compiled by

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# Dissertation Abstracts in Mathematics Education, 1983

The dissertation abstracts in this compilation all appeared in Dissertation Abstracts International in 1983. They are reproduced directly from that reference source, with the permission of University Microfilms International. The 300 dissertations cited in the annual listing of research in the July 1984 issue of the Journal for Research in Mathematics Education are included, as well as the 55 dissertations which were located but could not be included in that issue. Dissertation abstracts are arranged alphabetically by author.

At the end, two items are provided. One is a subject index. The subject index can be used to locate dissertations of interest; dissertations are listed by author and school level. The second item is information regarding prices and ordering procedures for obtaining the complete dissertation from University Microfilms International.

This compilation is the result of the cooperation of two groups with ERIC/SMEAC. First, the Editorial Board of the Journal for Research in Mathematics Education, published by the National Council of Teachers of Mathematics, nurtured the idea. Second, University Microfilms International made it possible. Appreciation is extended to both groups. We hope this publication will provide useful information on dissertations in mathematics education.

### A METHOD OF INTERPRETATION OF THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN-REVISED TO ASSESS COGNITIVE STYLE

**Order No. DA8310261**

**Abbate, Louis Edward**, Ed.D. *University of Massachusetts*, 1983. 187pp. Director: Professor Ronald H. Fredrickson

This research assessed the accuracy of a system of interpretation of the WISC-R developed to assess cognitive style.

The research was conducted in two phases using the Arithmetic and Coding subtests of the WISC-R with eight learning disabled subjects. Subjects were assigned to one of four categories based upon their performance: (1) High Arithmetic, Low Coding, (2) High Coding, Low Arithmetic, (3) High Arithmetic, High Coding, (4) Low Arithmetic, Low Coding.

Phase One of the study was intended to assess the model's accuracy in predicting cognitive style. Results from individual subjects in Phase one revealed that the model was partially successful for all four categories.

Phase Two of the study was intended to assess the model's accuracy in determining appropriate instructional methodology given the assessed cognitive style. The model was accurate in the prediction of cognitive style for the High Coding, Low Arithmetic and Low Coding, Low Arithmetic categories and partially successful for the High Arithmetic, Low Coding and High Arithmetic, High Coding categories.

In both Phases of the study, the model's accuracy in prediction of the preferred expressive modality was limited; therefore, discretion must be used in interpretation of the results.

It was concluded that further research is necessary in an attempt to assess cognitive style. However, there is evidence to suggest that this method of interpretation of the WISC-R can be used as a means of assisting the school psychologist in developing a tentative diagnostic hypothesis about cognitive functioning.

### ATTITUDES OF ENGINEERING FACULTY TOWARD METRICATION SYSTEME INTERNATIONAL D'UNITES (SI) IN THE STATE OF MISSOURI

**Order No. DA8310362**

**Akhlaghi, Karim G.**, Ph.D. *University of Missouri - Columbia*, 1982. 94pp. Supervisor: Gregory C. Petty

*Purpose*. The purpose of this study is to assess the attitudes of engineering faculty in Missouri towards the International Metric System (SI) as a replacement for the English or customary system of measurement in the United States. The study will attempt to isolate and portray the salient variables which could influence and determine the attitudes of engineering faculty toward metrication.

More specifically, an attempt will be made to answer the following research question: What are the current prevailing attitudes of engineering faculty in the State of Missouri toward the overall implementation of the international system of units (SI) as the national system of measurement in the United States?

*Hypothesis of this study*. To answer the research question the following null hypothesis was formulated: (Ho) There is no relationship between the attitudes of engineering faculty toward the international system of units (SI) as a replacement for the English or customary system of measurement in the United States as compared by: (a) age; (b) when highest academic degree was achieved; (c) teaching experience; (d) non-academic work experience; (e) engineering department for which faculty member teaches.

*Method of investigation*. The data for this investigation was collected by means of a six-point Likert-type attitude scale, and a personal/professional data information form. An instrument was designed to compile metrical attitudes and personal data.

*Findings*. During the course of this investigation, it was found that generally a favorable attitude toward metrication exists among engineering faculty in the State of Missouri as ascertained by the overall high scores on the instrument (4.70 on the 6 point scale). This outcome is not startling when viewed from the total engineering educational perspective, since the educational community has long been supportive of the principles of metrication (SI). However, the attitudes toward metrication (SI) expressed in this study are somewhat more favorable than those displayed by related samples that provided data for the imposing U.S. metric study.

*Conclusion*. (1) Each item on the metrication (SI) attitude scale was marked in a manner noticeably favorable toward metrication (SI). Items phrased negatively toward metrication (SI), ranged well into the favorable categories. Therefore it may be concluded that engineering faculty in the State of Missouri possess a generally favorable attitude toward metrication (SI). . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

### MATHEMATICS LEARNING CENTERS IN TWO-YEAR COLLEGES

**Order No. DA8315270**

**Alberding, Arthur Paul**, Ph.D. *The University of Arizona*, 1983. 133pp. Director: Robert J. Letson

The purpose of this study was to ascertain those services and resources generally considered to be the essential parts of a mathematics learning center for students in two-year colleges by determining perceptions held by mathematics students and instructors toward these services and resources.

A questionnaire sent to the mathematics department chairperson in all two-year colleges revealed 25 colleges had comprehensive mathematics learning centers (offer tutoring, testing, calculators, counseling, computer terminals, reference books, and filmstrips/slides/tapes services). Questionnaires for algebra students and their instructors were then sent to the names supplied by 19 colleges with comprehensive mathematics learning centers.

Of the 837 student respondents, 38% indicated they had used the center. The most number of students had used the tutoring service. Each service was rated for the student feelings about the amount of time they used it and the help they received for satisfying their mathematical needs.

The students ranked tutoring, testing, calculators, counseling, reference books, computer terminals, and filmstrips/slides/tapes services from highest to lowest respectively, for helpfulness in learning mathematics.

Students gave various reasons for not using the center with 48% of the nonusers stating they knew about it but did not need to use it. The nonusers also checked the services they assumed would be of worth to them in their study of mathematics.

All student responses were compared by age, college load, and outside job hours groups.

Of the 33 instructor respondents, 94% recommended the tutoring service to students. The instructors rated the services for their feelings about the amount of input into each service and the support they received from each service in teaching algebra. Many instructors felt they had no input. They ranked the services for overall support provided in teaching algebra.

Guidelines were formulated for the development of a college mathematics learning center.

Based on this study, the conclusions were: (1) Tutoring is the most essential service. (2) Testing and calculators are very essential services. (3) The other services were less essential with computer terminals next to lowest and filmstrips/slides/tapes lowest. (4) Filmstrips/slides/tapes were more essential to instructors than to students.

### A MEASUREMENT OF THE RELATIONSHIP BETWEEN ESEA TITLE I PROGRAM MANAGEMENT AND STUDENT ACHIEVEMENT, ATTITUDE TOWARD SCHOOL, AND SELF CONCEPT

**Order No. DA8318645**

**Alfred, Elizabeth Ann**, Ph.D. *The University of Nebraska - Lincoln*, 1983. 118pp. Adviser: C. Cale Hudson

This study measured the relationship between the management practices of ESEA Title I programs and student achievement, attitude toward school, and self concept. Management was measured by the Nebraska Title I Management Scale, utilized by twenty-seven Title I project administrators in Title I schools. Achievement was based on the mean gain scores in remedial reading and mathematics as measured by standardized tests.

The procedure required Title I project administrators to conduct pre and post testing in reading and/or mathematics, student self concepts, and student attitude toward school. The Nebraska Title I

Management Scale was administered at three intervals during the project year. Scores for the management scale utilization were correlated with student achievement, self concept, and attitude toward school mean scores.

*Conclusions*. The hypotheses directing this study were that there was no relationship at the .05 level of significance between the Nebraska Title I Management Scale score and:
(1) reading/mathematics mean scores variance, (2) student attitude toward school test scores, and (3) student self concept test scores.

The study rejected hypothesis 1 and retained hypotheses 2 and 3.

*Recommendations*. (1) A handbook should be developed for the Nebraska Title I Management Scale to aid in its appropriate implementation. (2) Title I project administrators should consider including program objectives directed toward student self concept and attitude toward school.

## THE COGNITIVE PROCESS FOSTERED BY THE IRAQI MATHEMATICAL TEXTBOOKS AS REVEALED BY CONTENT ANALYSIS Order No. DA8301131

AL-SALOOM, ABDUL HUSSAIN M., ED.D. *University of Northern Colorado*, 1982. 101pp.

*Purpose*. The purposes of this study were: (1) To identify, through review of existing literature and research, the levels of cognitive processes contained in the problems and exercises in elementary school mathematical programs, grades four to six. (2) To determine the extent to which these identified cognitive levels are represented in Iraqi mathematics textbooks, grades four to six, in regard to the cognitive processes fostered by the content of the problems and exercises. (3) To examine and compare, grade level by grade level, the progressively increasing or decreasing frequencies and proportions of problems and exercises in each of these levels of cognitive behavior.

*Procedures*. A sample of twenty-five percent of the problems and exercises contained in Iraqi elementary school textbooks currently used in grades four, five, and six were analyzed and classified according to Romberg's (School Mathematics Study Group) seven levels of cognitive behavior. Frequencies were compiled and tabulated for each level of cognitive behavior at each grade level. Comparisons of frequencies were made by using chi-squares.

*Findings*. The major findings of this study are as follows: (1) In the fourth grade mathematics textbook, there were 1,364 activities included; 1,215 activities were in the fifth grade textbook; and 458 activities were included in the sixth grade textbook. (2) In the Iraqi mathematics textbooks, emphasis was placed upon low level cognitive behaviors in all three grades. (3) The fourth grade mathematics textbook had more emphasis on high level cognitive behaviors than did fifth or sixth grade.

*Recommendations*. The following recommendations are suggested: (1) Authors should carefully consider the number of activities assigned to each grade level. (2) The Iraqi elementary school mathematics textbooks for fourth through sixth grades should incorporate greater articulation of content and cognitive development from grade level to grade level.

## FRESHMEN SEX ROLE SELF CONCEPT, ACADEMIC ACHIEVEMENT AND CAREER CHOICE Order No. DA8323163

AST, SHELLEY, PH.D. *Yeshiva University*, 1983. 120pp.

The effects of sex role self concept on sex differences in reading, writing and mathematics achievement were investigated for 299 male and 101 female high school seniors about to enter their first semester at a large urban four-year public college. The effects of the interaction of achievement and sex role self concept on choice of college major were also investigated. The Bem Sex Role Inventory was administered and analyzed by the median-split method, thus classifying all students into one of the four sex role orientation categories of masculine-typed, feminine-typed, androgynous, and undifferentiated. Reading, writing and mathematics tests were administered to all students as part of their college entrance requirements, and scores from these tests were used as the measure of achievement in these areas. The extent of students' high school mathematics background was analyzed and used as a covariate in analyses involving mathematics achievement. Results indicated significant sex and sex role differences in achievement, career choice, and mathematics background. In general, results reflected expectations based on societal sex role stereotypes of achievement and career pursuits. That is, males performed better in mathematics and females performed better in writing. This was further reflected in career choice with males significantly over-selecting college majors which required mathematics background. In addition, sex role self concept was found to be a contributing factor to the sex differences obtained in the present study, such that for both sexes, students with high masculinity scores performed better in mathematics achievement and students with high femininity scores performed better in writing achievement. Contrary to expectations, males performed better than females in reading achievement, and for both sexes, students with high masculinity scores performed better than students with low masculinity scores in reading achievement. In terms of female mathematics performance, the notion of possible gender sex vs. psychological sex role conflict was presented and discussed. Results were discussed in terms of socialization practices inhibiting mathematics achievement in females and the implications of this for career opportunities.

## ORAL READING BEHAVIOR AND ITS RELATIONSHIP TO SOLVING OPEN ADDITION AND SUBTRACTION SENTENCES Order No. DA8314704

AVIV, CHERIE DENISE ADLER, ED.D. *University of Georgia*, 1983. 179pp. Director: William D. McKillip

*The Problem*. The purposes of the study were to investigate the ability of second-graders to read open addition and subtraction sentences, to investigate the relationship between the ability to read an open sentence and the ability to solve an open sentence, and to determine what solution strategies second-graders use while solving open sentences.

*Procedures*. To assess children's ability to read open sentences and to determine if the inability to solve an open sentence resided in improper recoding of the sentence. The two-stage model of the reading process suggested two testing conditions: Visual and Auditory Modes. To assess children's ability to solve open sentences in an oral problem context the Problematic Mode was developed. Twenty-four second-graders, classified into two groups, high and low mathematics, participated in each of the task modes. After the students responded to the orally stated open sentence, their own or the investigator's, or the game item, their solution strategies were classified into one of 24 categories identified by the investigator prior to the conduct of the study.

*Results*. Incorrect oral readings of the sentences were attributed to using a wrong name or omission of symbols. The types of reading and solving errors made by the students who had difficulty reading open sentences were: errors due to recoding a sentence incorrectly, errors due to decoding a sentence incorrectly, and errors due to applying an appropriate solution strategy incorrectly.

Memory relationships were most frequently used solution strategies. The second most frequently used category was counting. Related fact and counting-on were frequently associated with addition sentences, inverse fact and counting-back were frequently associated with subtraction sentences.

*Conclusions and Implications*. Some children incorrectly recoded open sentences but attempted to solve the reconstructed, although not always correctly. Some students could solve game items but not the corresponding symbolic open sentences. Some students did not seem to know the names of the symbols in a sentence. Other students misused or incorrectly used an appropriate solution strategy to solve the sentences. The results indicated the need to teach the vocabulary of mathematical symbols, to teach the reading of open sentences, as well as the need to emphasize appropriate use of solution strategies.

### DIFFERENCES IN PERSONALITY, ATTITUDE, AND COGNITIVE ABILITIES FOUND AMONG BIOLOGICAL, PHYSICAL SCIENCE, AND NONSCIENCE STUDENTS

**Order No. DA8301562**

**Baker, Dale Rose Raczkowski**, Ed.D. *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 137pp. Chairperson: Michael D. Piburn

This research focuses on the differences found between sexes and among majors in a sample of 180 males and females in biological, physical science, and nonscience college majors. Spatial ability, mathematical ability, attitude toward science, Jungian personality type, and stereotypical masculinity and femininity were the variables chosen for this study.

Analysis of variance and discriminant analysis indicated that the personality of males and females differed in terms of their decision-making preferences. Males preferred to make decisions based on logical analysis and females preferred to make decisions based on personal values. Science majors had higher mathematics scores than nonscience majors. This is attributable to the higher mathematics scores of the physical science majors. There was no difference in the mathematics scores of biological and nonscience majors.

All science majors had the expected scientific personality and a positive attitude toward science. Non-science majors had the expected nonscientific personality and a negative attitude toward science. Male science and nonscience majors and female physical science majors rated themselves as having stereotypical masculine characteristics. Female nonscience majors rated themselves as having stereotypical feminine characteristics. Female biology majors were predominantly feminine in their self ratings (80%).

Males did not perform better than females on the test of spatial ability, but science majors did perform better than nonscience majors on the spatial test. However, this difference was not as important as the factors of personality, mathematical ability, attitude toward science, and stereotypical masculinity and femininity in discriminating between science and nonscience majors.

It appears that mathematics as a factor of success in science is more important for the physical sciences than the biological sciences. The same is true for stereotypical masculinity and femininity, especially for women.

### *SPATIAL VISUALIZATION*: SEX DIFFERENCES, GRADE LEVEL DIFFERENCES AND THE EFFECT OF INSTRUCTION ON THE PERFORMANCE AND ATTITUDES OF MIDDLE SCHOOL BOYS AND GIRLS

**Order No. DA8303753**

**Ben-Haim, David**, Ph.D. *Michigan State University*, 1982. 245pp.

*Purpose*. This study had two related purposes: first, to determine existing differences in spatial visualization abilities and in attitudes toward mathematics of fifth through eighth grade students by sex and grade prior to an instructional intervention; second, to analyze the effects of instruction on the spatial visualization skills and attitudes toward mathematics of a sample of sixth, seventh, and eighth grade students by sex and grade. Also, the study compared attitudes toward mathematics and spatial visualization and examined differences in attitudes toward spatial visualization by sex and grade.

*Methodology*. There were 1327 fifth through eighth grade students from three sites in and around Lansing, Michigan, who participated in the assessment of differences prior to the instruction. Of these, 430 sixth, seventh, and eighth graders participated in the evaluation of the effects of the instruction and comparison of attitudes; of the 430 students, 238 took part in the evaluation of the persistence of the effects.

The instruments used included a spatial visualization test and two semantic differential scales to measure attitudes toward mathematics and spatial visualization. The spatial visualization instruction material included ten sequenced activities which required two to three weeks of instructional time. The statistical analyses included multivariate and univariate analysis of variance and repeated measures.

*Major Results*. Prior to instruction, there were significant (1) grade differences in spatial visualization performance (increasing with age) and in attitudes toward mathematics (decreasing with age). (2) sex differences in spatial visualization performance (favoring boys), but no sex differences in attitudes toward mathematics. (3) site differences in spatial visualization performance; as the socioeconomic status rose, the performance increased.

After the instruction: (1) Sixth, seventh, and eighth grade boys and girls performed significantly higher on the spatial visualization test; however, no change in attitudes toward mathematics occurred. (2) Boys and girls gained similarly from the instruction, in spite of initial sex differences. (3) Students' attitudes toward mathematics and spatial visualization were similar. (4) Grade differences (decreasing with age) in attitudes toward spatial visualization were found, but no sex differences. (5) Retention of effects persisted. After a four-week period, boys and girls performed higher on the spatial visualization retention test than on the posttest.

### A LONGITUDINAL STUDY OF AN ALTERNATIVE ORGANIZATIONAL AND INSTRUCTIONAL MODEL FOR ACADEMICALLY HIGH-RISK PRIMARY-LEVEL CHILDREN

**Order No. DA8229461**

**Bedi, Stephen Stalker**, Ed.D. *The George Washington University*, 1982. 170pp. Chairperson: Rita Klein Ives

This study examined the effect of the three-year Primary Developmental Program (PDP) on the academic achievement of 22 low socioeconomic level, predominantly black, academically high-risk, primary-level children. The ultimate goal of the PDP was to bring the students' reading and mathematics achievement to the fifth month of the second grade (2.5) level by the end of the third grade. It was hypothesized that there would be a significant difference in achievement gains in reading and mathematics between PDP students and similar students in regular elementary classrooms by the end of the third grade.

The PDP subjects were grouped in a structured, self-contained class for three years. No grade level accountability existed. The curriculum goals of the local school district remained the goals of the PDP. The difference was in the instructional rate, manner of presentation, and finite task analysis of each new skill. PDP subjects moved at the instructional rate at which mastery took place. All instructional support was provided within the PDP classroom by a three-member team.

Standardized achievement tests were administered in the fall and spring of Grades 1, 2, and 3. An analysis of covariance was performed on the posttest data for each year to determine group differences in residual gain scores. The analysis of the data obtained at the end of the third grade revealed that PDP subjects made significantly higher achievement gains in reading and similar achievement gains in mathematics as compared to the control group. In addition, 84% met the minimum competency level of 2.5 in reading, and 77% attained this level in mathematics.

The results of the study, although limited in generalizability due to small sample size, offer to elementary schools one possible cost-efficient alternative organizational and instructional model to increase the acquisition of basic skills in primary-level children. The PDP was designed by reorganizing staff, rather than by employing additional personnel. A replication of this pilot study that includes a larger sample size is recommended. In addition, key components of the PDP, i.e., time to learn, mastery learning, pupil-adult ratio, and homogeneous self-contained grouping, should be systematically varied and measured to determine the impact of each variable on the academic achievement of academically high-risk primary-level children.

### A COMPARISON OF SELECTED BASIC SKILLS AND PERSONALITY CHARACTERISTICS IN ADULT BASIC EDUCATION/GENERAL EDUCATIONAL DEVELOPMENT (ABE/GED) AND DEVELOPMENTAL EDUCATION STUDENTS

**Order No. DA8304685**

**Benhani, Nancy Gabbert**, Ed.D. *Oregon State University*, 1983. 99pp.

The purpose of the study was to determine whether Adult Basic Education/General Educational Development students and Developmental Education students are significantly different in selected basic skills and in selected personality characteristics. The population of the study (N = 100) consisted of equal numbers of students enrolled in ABE/GED and DE classes at Portland Community College, a metropolitan, open door, comprehensive community college in Portland, Oregon.

The following data was gathered on each subject: (1) brief demographic data (age, sex); (2) reading, writing, and computation sub-scores from the Comparative Guidance and Placement battery; (3) 28 sub-scores on the Cognitive Skills Mapping instrument, each representing a cognitive personality trait; and (4) a locus of control score based on the Adult Norwicki-Strickland Internal-External Scale. A one-way analysis of variance using Statistical Package for the Social Sciences was used to analyze the data. Of the 32 null hypotheses generated, 29 were retained; three were rejected ($p = .05$). In the three rejected sub-hypotheses, the group means were significant at the .05 level. The personality traits represented by the rejected sub-hypotheses relate to proxemics, temporality and categorizing as a logical device.

The data suggests that distinguishing between ABE/GED and DE students in programs teaching basic skills is unnecessary since students in ABE/GED and DE classes are far more similar than they are dissimilar.

### THE RELATIONSHIP BETWEEN SELECTED DEMOGRAPHIC, ACADEMIC, AND APTITUDE VARIABLES AND STUDENT GRADE ACHIEVEMENT IN A FIRST COURSE IN COMPUTER SCIENCE

Order No. DA8227536

**BENNETT, EDWARD CLIFTON, Ed.D.** *Mississippi State University*, 1982. 83pp. Director: Harold J. Morris

This study investigated the relationship between selected demographic, academic, and aptitude variables and grade achievement in a first course in computer science. The demographic variables considered in this study were: age, race, and sex. The academic variable considered in this study was quality point average. The aptitude variables considered in this study were: American College Test (ACT)--English, mathematics, natural science, social studies, and composite; the *Computer Programmer Aptitude Battery* (CPAB)--verbal meaning, reasoning, letter series, number ability, diagramming, and total score.

The subjects studied were 175 students at Mississippi State University randomly selected by computer into six sections of a required introductory course in computer science for all computer science majors. These six sections were taught by three different instructors.

As a means of structuring the investigation, answers were sought to four questions which were statistically tested by multiple regression analysis at the .05 level of significance. These questions asked whether a statistically significant relationship existed between demographic, academic, and aptitude variables and the criterion variable grades in a first course in computer science.

Results indicated that there was a statistically significant relationship between the demographic variables of age, race, and sex and the criterion variable grades in a first course in computer science. The demographic variables explained a total of 13.53 percent of the variance in grades. There was a statistically significant relationship between the academic variable quality point average and grades in a first course in computer science. The academic variable QPA explained a total of 22.13 percent of the variance in grades in a first course in computer science. There was a statistically significant relationship between aptitude variables and grades. The aptitude variables explained a total of 32.72 percent of the variance in grades in a first course in computer science. There was a statistically significant relationship between the combination of demographic, academic, and aptitude variables. When the combinations of demographic, academic, and aptitude variables were considered, a total of 47.08 percent of the variance in grades was explained.

### SELF-INITIATED GOAL STATING AS A STRATEGY IN ATTENDING BEHAVIOR AND ARITHMETIC PERFORMANCE IN LOW ACHIEVING AND DISTRACTIBLE BOYS

Order No. DA8322614

**BENSON, STEVEN LAWRENCE, PH.D.** *State University of New York at Albany*, 1983. 141pp.

Recent research has investigated a variety of cognitive strategies that are hypothesized to be influential interventions for self-regulation in children. This study investigated the effects on two levels of achievement when children were trained to set their own goals as compared with children who were provided goals by an adult. The levels of performance studied were daily observed on-task behavior and daily recorded levels of two achievement measures. Thirty-two boys, ages 6.1 - 11.8, were assigned to four experimental groups. Two groups, one high distractible and one low distractible, were trained to initiate their own goal setting on a computerized mathematics task. Two other groups, one high distractible and one low distractible, received a daily performance goal from an external monitor while working on a computerized mathematics task. The study consisted of three phases: a five-day baseline phase where daily recordings of on-task behavior at the computer and in a classroom were used to assign subjects to one of four experimental groups; a six-day treatment phase enabled 16 subjects to be trained in initiating their own goal setting while 16 other subjects received daily performance goals; a three-day post-treatment phase immediately followed treatment and provided a measure of the transfer effects of training. Group differences in on-task behavior and achievement were then analyzed through a repeated measures ANCOVA with IQ as a covariate.

The major hypotheses predicting that subjects trained to initiate their own goal setting would demonstrate significantly greater increases in on-task behavior and level of achievement when compared to externally-imposed groups failed to receive statistical support. However, differences between high and low distractible subjects, within the externally-imposed groups, in on-task behavior at the computers were significant. A phase effect was significant while subjects worked in the classroom. IQ was a significant covariate. A post hoc analysis revealed significant differences between the two high distractible groups favoring the goal staters. The study's results were discussed within the content of current research on the regulation of children's behavior and suggestions were made for future research in schools.

### CONSERVATION ABILITIES OF AGING ADULTS: AN ASSESSMENT OF NORMAL AND RETARDED POPULATIONS

Order No. DA8311430

**BENTLEY, NELSON GARDNER, PH.D.** *Howard University*, 1982. 179pp.

The purpose of this investigation was to evaluate the conservation abilities of aging normal and aging retarded individuals, and thereby to address the question of a decline in these abilities with age. The procedure involved giving the Slosson Intelligence Test and a task battery consisting of standard Piagetian measures assessing conservation of number, substance, weight, and volume to 120 participants. There were an equal number of normal elderly, normal young, retarded elderly and retarded young participants.

The data for the normal participants and the retarded participants were analyzed separately using a 2 x 3 x 4 x 2 mixed-model analysis of variance. The results for the normal participants indicated a statistically significant difference among the criteria for conservation, a statistically significant difference among the type of conservation problems, and a statistically significant interaction between the criteria for conservation and the type of conservation problem. For the retarded participants there was a statistically significant difference among the criteria for conservation, the type of conservation problem and significant interactions between the type of conservation problem with age, the criteria for conservation with the type of conservation problem, and the criteria for conservation with the type of conservation problem with age. There was no significant main effect for the age variable in either group.

It was concluded that the notion of conservation abilities declining solely as a result of the aging process is unsubstantiated. Age, by itself was the least important factor related to the conservation abilities of both populations studied. For the normal population, it appears that if an aging person is healthy, active, and engaged in meaningful enterprises, then his conservation abilities are likely to be no different than those of a younger person. As for the population of aging retardates, it appears that these individuals do exhibit a decline in their conservation abilities, but these findings should be taken cautiously since this portion of the study was plagued by many of the contaminating variables that have restricted the validity of past studies on the conservation abilities of aging normals. Finally, in terms of the methodological issues that were addressed, it was clear that the response criteria play a significant role in the determination of whether one is determined to be conserver or a nonconserver. The need for additional research in this area was stressed, and topics for future research were suggested.

## NEED FOR APPROVAL AND THE EFFECTS OF INCENTIVE AND KNOWLEDGE OF RESULTS ON CHILDREN'S PERFORMANCE

**Order No. DA8310233**

**Berkman, John Francis**, Ph.D. *Hofstra University*, 1982. 122pp.

The present study attempted to investigate the effects of differing types of incentives (normative, competitive and no incentive) and knowledge of results on the performance of 7th and 8th grade children divided along the personality characteristic of need for approval (NA).

The Children's Social Desirability Scale (Crandall, Crandall & Katkovsky, 1965) was used to delineate the high need for approval (HNA) Subjects from the low need for approval (LNA) Subjects. An academic task (sentence writing) and a work task (numbers cancellation) were the dependent measures. It was predicted that the HNA Subjects would perform better under a normative incentive condition versus a competitive incentive condition and that the provision of knowledge of results would improve performance over a no knowledge of results condition.

The results of the research confirmed the hypotheses in some instances but not in others. The research indicated the important influence of task type as a function of performance. That is, while some of the hypotheses were confirmed for the academic task (sentence writing), none of the hypotheses were confirmed for the work task (numbers cancellation). Additionally, the data indicated that in the absence of specific task instructions, the type of knowledge of results provided (i.e., partial or complete) can have a confounding impact on how the requirements of a task are perceived by Subjects.

The research discussed the implications of the results and remedies which future researchers might employ while investigating the variables in question.

## FACULTY TRUST AND ACCEPTANCE OF DECISIONS MADE AT THREE HIERARCHICAL LEVELS OF A COLLEGE BY SEXUALLY-DEFINED DEPARTMENTS

**Order No. DA8228365**

**Berkovitz, Roslyn A.**, Ph.D. *Cornell University*, 1982. 206pp.

The major purpose of this study was to determine whether faculty in four-year colleges of arts and science, from three different disciplines classified as masculine, neutral and feminine, trust and accept differently decisions made at three hierarchical levels of a college.

A two-part questionnaire was sent to all full-time faculty in the mathematics, psychology and English departments in 12 colleges. Part I requested demographic information and perceptions and opinions regarding decisions made at the respondents' colleges. These data were used for predictive hypotheses. Part II, consisting of a six-question Likert-type scale, was used to measure the degree of trust and acceptance of decisions at the three hierarchical levels.

In the 425 usable returns (66.3%) faculty showed a significantly higher degree of trust and acceptance of decisions made at the departmental level than at the level of the dean than at the central administrative level.

At the department level trust and acceptance of decisions were predicted by the chairperson's support of department decisions and the faculty's input into these decisions. At the level of the dean, trust and acceptance of decisions were predicted by the low degree of faculty input into decisions and to which faculty perceived administrators knowing and understanding problems, and the high desire of faculty to have input into decisions. At the central administrative level, trust and acceptance of decisions were predicted by the low degree to which faculty perceived administrators knowing and understanding problems and to which administrators make decisions that benefit faculty; by the high desire of faculty to have input into decisions; and the low degree of input faculty do have.

Other findings were: (1) older women trusted and accepted decisions at the department level significantly more than younger women; (2) faculty in mathematics trusted and accepted decisions at the level of the dean significantly more than faculty in either psychology or English; (3) older faculty trusted and accepted decisions at the central administrative level significantly more than younger faculty; (4) faculty in mathematics trusted and accepted decisions at the central administrative level significantly more than faculty in psychology but not significantly more than faculty in English.

## THE EFFECTIVENESS OF MATHETICS IN MATHEMATICS IN RELATION TO CERTAIN STUDENT'S CHARACTERISTICS

**Bhartiya, Anil**, Ph.D. *Meerut University (India)*, 1981. Supervisor: Dr. R. A. Sharma

The study was designed to explore the relationship of student's characteristics with the mathetical performance.

The hypotheses examined were that the intelligence, creativity, stability, introversion, and level of aspiration are significantly related with the mathetical performance and there are significant interaction effects among student's characteristics with regard to mathetical performance. The cluster sampling technique was employed to select a sample of 100 boys and 96 girls of IX class. The stratification was done on the basis of student's characteristics by using Kelley's dichotomy.

The subjects were given the pre-test, Mathetical learning package on 'Factors' in Algebra, and the criterion test. The individual traits were measured by the GMA test of Jalota, Mehadi's Verbal Test of Creative Thinking Ability, Hindi adaptation of Eysenck's MPI by Jalota and Kapoor, and Level of Aspiration test of Shah and Bhargava.

The experimental method was used. The mathetical learning was experimental variable. The student's characteristics were independent variables. The sex was moderator variable.

The inter-correlations among student's characteristics and mathetical performance were computed by Product Moment method. The multiple correlation of the selected five individual variables with mathetical performance was computed by Aitken's method. The unweighted means analysis was done by applying the analysis of covariance technique for the combinations of Intelligence (I) x Creativity (C) x Sex (S); Neuroticism (N) x Extraversion (E) x S; Levels of Aspiration (L) x S; I x N; C x E; I x E; C x N; L x I; L x C; L x N; and L x E.

The intelligence, creativity, introversion, stability, and level of aspiration appeared to be significantly related with the mathetical performance but not the sex. The girls showed significantly better performance than boys in case of low intelligent low creatives, neurotic extraverts and low intelligents. Among the girls extraversion was not significantly related to their performance.

There was no significant difference in introverts and extraverts at high creativity and also at high intelligence but the introverts were better than extraverts at low creativity and at low intelligence. There was significant interaction between creativity and level of aspiration with regard to mathetical performance.

There were no significant interaction effects of IxC; C x S; N x E; L x S; I x N; C x N; L x I; L x N; and L x E on mathetical performance.

The multiple correlation of five student's characteristics (ICNEL) with the mathetical performance were found to be significant.

## GIFTED CHILDREN IN MATHEMATICS: CASE STUDIES

**Order No. DA8303086**

**Bhattacharya, Dipendra Narayan**, Ed.D. *State University of New York at Buffalo*, 1982. 197pp.

*Objective*. The main purpose of this investigation was to gain an understanding in depth of the mathematically gifted student and his environment and his perceptions of that environment. The frame of reference from which the mathematically gifted student functions was the main focus but an understanding of the similarities and differences in the ways they each perceive their environment from the manner in which it is perceived by their parents and siblings were also sought.

The subjects were four mathematically gifted students in grade seven, eight, nine, ten, respectively, from four local schools. The subjects were identified as gifted for a program at the State University of New York at Buffalo; they scored exceptionally high on the entrance examinations.

*Procedures*. Separate questionnaire forms were administered to the students and their parents. When questionnaires were completed and returned, personal interview dates with the families and students were set. The intensive personal interviews with each student, his parents and siblings were then conducted. Throughout the investigation, the investigator also collected data as a participant observer, while spending time with them as their teacher and investigator for several months. From all information that was obtained, case studies were developed for each of the students.

*Findings*. The perceptions and feelings of the four gifted students were, in most cases, very similar. Math was enjoyed as a subject because it offers fun, challenge and useful ideas. School presented them with an often too easy, boring and unchallenging situation. They were unhappy with being held back in their academics by their teachers and guidance counselors.

Environmental factors at home played an important role. These students were aware of their giftedness and the problems that they faced as a result. The home environment of these particular students was very desirable for each of them, and one which provided stimulation, challenge and freedom.

After examining these mathematically gifted students closely, two general truths were found: first, that gifted students have had many of the same experiences and share many of the same concerns; second, that these students perceive their environment in much the same way that it is perceived by other family members.

### A COMPARISON OF THINK ALOUD AND THOUGHT LISTING METHODS OF COGNITIVE ASSESSMENT WITH MATH ANXIOUS COLLEGE STUDENTS Order No. DA8316576

BLACKWELL, RICHARD THOMAS, PH.D. *The University of North Carolina at Chapel Hill*, 1983. 246pp. Supervisor: John P. Galassi

This study investigated effects due to method of cognitive assessment--think aloud versus thought listing--on content, time, performance, and anxiety of mathematics anxious college students as they solved mathematics problems. Sixty-four subjects were selected randomly by sex from students scoring in the top third of 609 undergraduates at the University of California at Irvine who were administered the Mathematics Anxiety Rating Scale, a self-report measure of mathematics anxiety. Subjects were assigned randomly by sex to one of four groups with subjects nested in assessment order and problem order and repeated measures on assessment method (i.e., split-plot design).

Sixteen subjects in each group completed two sets of mathematics problems, with order of assessment and problems varying among groups and all subjects exposed to both assessment methods and problem sets. Subjects' time to complete problems, anxiety (SUDS) during each phase, and number of problems correct were recorded.

Cognitive data were transcribed, unitized, and scored for cognitive content by two sets of independent judges. Interrater agreement for unitization and scoring was 96.5% and 95.8%, respectively.

Data were analyzed by a split-plot multivariate analysis of variance to investigate differences between methods and split-plot univariate analyses for each cognitive content variable, time, performance, and anxiety.

A significant multivariate effect was found. Moreover, significant effects on time, anxiety, and 6 of 11 cognitive content variables were found. There was a marginally nonsignificant content variables performance measure. Thought listing took significantly longer and produced significantly higher anxiety than did thinking aloud. Thinking aloud produced significantly more task-oriented cognitions and thought listing significantly more positive evaluative cognitions. Significant interactions were found on the time and one cognitive content variable.

The results supported the hypothesis that the cognitive assessment methods did yield different data. Findings were discussed in reference to research and clinical selection of cognitive assessment methods. Comparability of results from studies using different cognitive assessment methods was questioned. Recommendations for selection of cognitive assessment methods were made and areas for future research suggested.

### THE EFFECT OF LANGUAGE ON WECHSLER ADULT INTELLIGENCE SCALE-REVISED ARITHMETIC SUBTEST SCORES Order No. DA8319387

BLAKE, ANN BETH, PH.D. *University of Washington*, 1983. 208pp. Chairperson: Professor Lawrence M. Brammer

The effect of language format on mathematics performance was investigated to determine if second-person, non-gender-specific language format produced higher mathematics scores than third-person neutral or gender-specific language formats. Anxiety and attitudes toward mathematics were also assessed for their effect on mathematics performance.

The Wechsler Adult Intelligence Scale-Revised (WAIS-R) Arithmetic subtest, a widely used and accepted instrument, was the basis for the independent variable. With no alteration of computational processes required for solution, the sentence subject of each WAIS-R Arithmetic subtest item was reformulated into four language formats: personalized non-gender-specific ("you"), neutral non-gender-specific ("a person"), feminine gender-specific ("a woman"), and masculine gender-specific ("a man"). The four formats were randomly assigned to each word problem item, producing four parallel Arithmetic subtest forms. The forms were randomly assigned to 80 undergraduate teacher education students in timed and non-timed test contexts.

Three types of anxiety were measured. The State-Trait Anxiety Inventory assessed situational (state) and generalized (trait) levels of anxiety; anxiety specific to mathematics was measured by the Mathematics Anxiety Scale of the Fennema-Sherman Mathematics Attitude Scales.

Because each person received a random assignment of all four language formats, a repeated-measures design of multivariate analysis of variance (MANOVA) was used to determine the statistical significance between the independent variable (four language formats) and the dependent measure (WAIS-R scores on the four language formats). The moderating variables of anxiety and mathematics attitudes were also analyzed.

The hypothesis that participants score higher on the personalized non-gender specific items than the other three format items was not supported by statistical analyses. Analyses by *t*-test and MANOVA revealed no statistically significant relationships. Possible explanations for these findings are a moderate sized sample; the limited range of possible scores for each format type; group, rather than individual, test administration; and inability to weight the test items to reflect increased difficulty level.

### EVALUATING INSTRUCTIONAL SOFTWARE FOR THE MICROCOMPUTER: AN ANALYTICAL EVALUATION PROCEDURE Order No. DA8304057

BLUM, VICKI LYNN, ED.D. *Columbia University Teachers College*, 1982. 266pp. Sponsor: Professor Robert E. Holloway

In the past three years there has been a phenomenal rise in the use of microcomputers in schools. When an educational software package is produced, there are no accepted criteria as to what comprises an effective instructional program. This study defines a list of criteria that are needed to evaluate instructional software for the microcomputer. Using those criteria, eight analysts evaluated the current commercial educational software programs on the market for school use. From this project an analytical evaluation procedure was developed which provides descriptive/prescriptive information about the instructional software programs. The software analysis instrument that was developed is unique in that it was designed to evaluate the capabilities of the microcomputer.

A reliability study was conducted throughout the project. This was done by using a baseline score and comparing the analysts' responses across all items. It was then possible to determine if there was agreement or variance on an item. The accuracy of the analysts' responses varied from 72% on the first evaluation to 96% on the last evaluation.

The significant findings show that most large commercial courseware programs on the market are arithmetic programs which stress a drill and practice application and are designed to be used in elementary schools. The major emphasis of the objectives was recall of previously learned facts and they did not stress higher-order skills. Few programs are designed to teach concepts, rarely are graphics embedded in the instructional content, very little user control is granted to the student, most feedback responses did not remediate the wrong answer, half the programs used some form of diagnostic management (or branching), and two of the programs had a fairly sophisticated management system.

It was concluded that most programs did not utilize many of the instructional strategies which would facilitate learning. There needs to be more programs that teach problem-solving techniques and concepts. Additional ways of interacting with the microcomputer other than drill and practice should be explored and the programs need to expand beyond just arithmetic skills. Specific guidelines and directions that consumers and producers can attend to are offered in this study.

### THE DEVELOPMENT AND EVALUATION OF AN INTRODUCTORY UNIT ON CIRCULAR FUNCTIONS AND APPLICATIONS BASED ON USE OF SCIENTIFIC CALCULATORS Order No. DA8322178

BONE, DOROTHEA DARROW, ED.D. *Columbia University Teachers College*, 1983. 184pp. Sponsor: Professor Bruce R. Vogeli

The purpose of this study was to develop and evaluate through a field trial an introductory module on the circular functions and related applications. The materials were a response to the availability of inexpensive scientific calculators and the desire to bring the circular functions closer to the experiences and interests of students not headed toward technical or scientific work.

An eight week unit which combined exploratory exercises and expository presentations leading to the definition of the trigonometric functions in terms of a point on the unit circle was prepared. From the beginning these functions are seen as examples of periodic functions. This leads naturally to an examination of simple harmonic motion, which is presented with reference to a weight bobbing up and down on a spring. The module concludes with a discussion of properties of vibrations which produce sound and an examination of the complex functions used to represent simple sound waves.

The module was field tested with a group of ten students attending an independent school in New York City. Three full period unit tests and two questionnaires, prepared by the investigator, were used to evaluate the success of the materials.

The unit tests reveal that a majority did learn the desired material.

The students did develop an appreciation for the variety of applications of the circular functions.

Responses on questionnaires suggest that this group did maintain their interest in the study of advanced mathematics and in some cases there was an increased awareness of the wide applicability of the study of mathematics to their lives.

Students of average and above ability can benefit from the study of the module.

Recommendations include suggestions for improving the materials, the continued use of calculators as an aid in the teaching of trigonometry, and a discussion of some places where microcomputers can be an additional aid.

### THE EFFECTS OF THE MONROVIA UNIFIED SCHOOL DISTRICT STATE PRESCHOOL PROGRAM ON STUDENTS IN ELEMENTARY SCHOOL Order No. DA8321042

BONNER, PATRICIA JANE, PH.D. *Claremont Graduate School*, 1983. 91pp.

The purpose of this study was to examine the effects of the Monrovia Unified School District State Preschool Program on students who attended from 1976 through 1981. Former preschool students were compared with a group of low-income, Free Lunch students in Academic School Performance, Non-academic School Performance, and Parental Attitudes and Values.

The subjects for the study were 710 first through fifth grade students, 303 in the preschool group and 407 in the comparison group. Instruments used were the California Achievement test, the Pupil Behavior Questionnaire, and the Parent Questionnaire.

Major findings of the study were: (1) There was no overall significant difference between the two groups in achievement. This lack of difference held up for sex, home language, and ethnicity, with the exception of first grade black students. (2) First grade black students in the preschool group scored significantly higher in both reading ($p = .014$) and math ($p = .038$). (3) Students in the preschool group were more likely to be at the correct grade placement for their age, i.e., not overage for their grade ($p = .006$). (4) Students in the preschool group were less likely to be identified as compensatory education ($p = .098$). (5) Preschool group students were rated significantly higher by their teachers in Academic Potential ($p = .033$) and Social/Emotional Development ($p = .044$). (6) Parents of preschool group students reported a higher rate of participation in all six listed school activities: Back to School Night, Open House, Parent/Teacher Conferences, PTA meetings, Parent Education Meetings, and Parent Volunteering. (7) A greater percentage of preschool group parents (25%) than comparison group parents (10%) indicated that they volunteered in their child's classroom.
(8) Preschool group parents reported that they volunteered in their child's classroom with greater frequency than comparison group parents (13.4% of preschool parents versus 1.3% of comparison group parents reported volunteering from 1 to 5 hours per week).

### THE IMPACT OF TEACHING TEST-TAKING SKILLS UPON THE SCORES OF SELECTED SECONDARY STUDENTS TAKING THE LOUISIANA STATE ASSESSMENT TEST Order No. DA8312075

BOWER, JOANN CRABTREE, PH.D. *The Louisiana State University and Agricultural and Mechanical Col.*, 1982. 164pp. Supervisor: Dr. James W. Firnberg

The purpose of this study was to investigate the impact of teaching test-taking skills upon the scores of selected secondary students. The interactions between the treatment and sex, socioeconomic status, ethnicity, and achievement level were also investigated.

The treatment consisted of four or five 50-minute periods of instruction and practice in selected test-taking skills which included marking answer sheets correctly and quickly, coordinating answer sheets and test booklets, developing a test cadence, fostering a positive test attitude, using deductive reasoning and guessing strategies, and using a relaxation technique during a test situation.

The treatment was administered to four experimental groups in a sample which consisted of 110 sophomore students in eight randomly selected, average ability English classes.

Within one week following the treatment, all students in the study took the Louisiana State Assessment Test which consisted of three subtests in reading, writing, and mathematics.

Five null hypotheses were tested at the .05 level of significance using general linear regression model analysis of variance procedures. In the instances where significance was indicated, t-tests were used at the .02 level of significance to determine the differences between the least squares means of the experimental and control groups for the reading, writing, mathematics, and composite scores.

While all five hypotheses were accepted, indicating no significant differences between the experimental and control groups due to the main effect of the treatment or to the interactions between the treatment and sex, socioeconomic status, ethnicity, or achievement level, there was scattered evidence that the instruction in test-taking skills benefited the minority students and the students categorized as high achievers. Reading and mathematics were the areas in which some impact of the treatment could be detected. As was anticipated, the qualitative writing skills did not appear to be affected by the treatment.

### THE EFFECTS OF SELECTED VARIABLES IN THE ARITHMETICAL VERBAL PROBLEM SOLVING PERFORMANCE OF LEARNING DISABLED CHILDREN

Order No. DA8314598

**Breault, Mary Ann**, Ph.D. *The University of Connecticut*, 1983. 203pp.

The purpose of this study was to assess the effects of selected variables on the arithmetical verbal problem solving performance of learning disabled children. The literature search reveals that much has been done in assessing the EMH and slow learner child, but that there is a detrimental scarcity in research with the learning disabled child. The variables--extraneity versus exact information, operational complexity and syntactical complexity have been studied to some extent with the EMR children, but this combination has not been studied with the LD children. The study revealed that there is a statistically significant difference between extraneous and non-extraneous problems and between addition and subtraction problems. No significant difference was found among the three syntactically different problems and no significant difference was found in the interaction between or among information, operation, and syntactic attribution.

### THE FEASIBILITY OF IMPLEMENTING AN EVALUATION MODEL TO ASSESS GROUP ACHIEVEMENT AND ATTITUDINAL CHANGES

Order No. DA8304355

**Brimlow, Patricia Anne**, Ph.D. *Ohio University*, 1982. 171pp.
Director of Dissertation: Dr. Robert S. Barcikowski

The purpose of this study is twofold: first, to determine whether or not the B-model is a practicable one for classroom use; second, to ascertain whether or not a system can be developed and implemented that can measure gains in achievement and changes in attitude toward mathematics of a remedial college mathematics course over an extended period of time.

A repeated measures analysis, using SPSS (Manova), was used to test for significant differences in achievement and attitudinal changes toward mathematics over a ten week period. Data from seven sections of a freshman level remedial mathematics course taught at Ohio University were analyzed. The analysis tested for trends over time (weeks), and for differences in achievement and attitude toward mathematics among seven sections of Math 101. The analysis was also used to test for differences between instructors with public school teaching experience and instructors with no prior public school teaching experience, and to test for differences between American and foreign instructors.

The results of the study show that there was a multivariate significant difference among the seven groups. This difference was due primarily to achievement and not to attitude. It was also found that there was no multivariate significant difference between the groups that had instructors with public school teaching experience and the groups that had instructors with no prior public school teaching experience. With respect to the difference between groups with American insructors and groups with foreign instructors, again no multivariate significant difference was found. There was a multivariate significant linear trend over time (weeks) which was due primarily to achievement.

The results of this study indicated that the B-model is practicable and, when implemented, is able to measure gains in achievement and attitudinal changes.

### RESOURCE ALLOCATION IN SEVENTH-DAY ADVENTIST ELEMENTARY SCHOOLS: AN EDUCATIONAL PRODUCTION FUNCTION STUDY

Order No. DA8320331

**Brown, Gerald Alan**, Ed.D. *Andrews University*, 1982. 207pp.
Chairman: Edward A. Streeter

*Problem*. Scarce resources and declining student achievement, heighten the need for schools to examine the resource allocation function more closely than ever to ensure that resources are being used most effectively. The purpose of this study was to evaluate the effects of selected school controlled variables on student achievement in Seventh-day Adventist elementary schools and to develop guidelines for the resource allocation function relative to these selected variables.

*Method*. Thirty schools on both grades three and six served as the population sample. Achievement scores were used as the determiner of school effectiveness. Three basic multiple regression procedures were used in the analysis of data: (1) zero order correlations, (2) individual stepwise multiple regression, and (3) group stepwise multiple regression. The last two procedures were repeated using the previous achievement status as control variables.

*Conclusions*. Major conclusions of the study were: (1) The best predictor of future achievement was the previous achievement status of the student. (2) Most of the variables entered into the prediction equations offered results that conflicted with their zero order correlations. (3) Urban schools rendered strongly negative associations with achievement. (4) Increasing the number of sponsoring churches (and thereby pooling resources) rendered negative associations with achievement. (5) Teachers with bachelor's degrees and/or additional experience were associated with achievement gains on the third-grade level. Opposite results, though somewhat mixed, tended to be true on the sixth-grade level. (6) The group of financial variables offered the weakest correlations with achievement when previous achievement was not controlled; when achievement was controlled, the three groups (school, personnel, and financial) offered approximately equally strong correlations.

*Recommendations*. (1) Whenever and wherever possible, schools should be located away from urban areas. (2) Schools should have as few sponsoring churches as possible. (3) When hiring teachers for the third-grade level, teachers without graduate degrees and/or with the most experience should be given preference. (4) Schools need to have a variety of positively correlated variables associated with their programs to offset the influences of a few strongly negatively correlated variables.

### EFFECTS OF DEVELOPMENTAL THERAPY ON CONCRETE-OPERATIONAL REASONING FOR A SAMPLE OF E-S-N CHILDREN

Order No. DA8303334

**Brunson, Larry DuRand**, Ed.D. *The University of Alabama*, 1982. 158pp.

This experimental research study was designed to investigate the effects of developmental therapy presented in mass and spaced formats on transfer to a criterion-referenced paper and pencil test of concrete-operational reasoning. The sample included 51 children within the IQ range of 70-80 (inclusive) who were receiving services in Educable Mentally Retarded/Learning Disabled high-school classes in the Dothan City Schools. The relationships among reading comprehension, mathematical reasoning, language expression, and concrete-operational reasoning also were examined. The measures used in this study were the California Achievement Test (*California Achievement Test Examiners Manual*, 1977) and a paper/pencil Test of Concrete-Operational Reasoning developed by Ankey and Joyce (1976).

Participants were pretested on concrete-operational reasoning using a paper/pencil method. They were randomly assigned to either a Mass, Spaced, or Control group. The Mass group received 10 developmental tasks during one therapy session which were modeled in a verbal-mediated format. The Spaced group received these tasks in the same format but the tasks were presented over a period of 5 days with two tasks per session. The Control group received practice in reading. A posttest on concrete-operational reasoning was then administered.

The Pearson product-moment correlation (*r*) was used to examine the relationships among reading comprehension, mathematical reasoning, language expression, and concrete-operational reasoning. No significant correlations among these concepts were reported. Chi-square ($\chi^2$) was computed for each item on the pretest and posttest. Selected items that investigated the concepts of conservation were extracted and compared to selected items that investigated other reasoning tasks. Analyses of variance of repeated measures by groups on concrete-operational reasoning were the statistical procedures used for comparing: (a) differences between groups on the pretest and posttest of concrete-operational reasoning.

(b) differences between scores on the pretest and posttest of concrete-operational reasoning, (c) interaction between groups and the pretest and posttest of concrete-operational reasoning, and (d) differences between experimental groups on a measure of verbal fluency.

The major findings of the study revealed a significant interaction between groups and the pretest and posttest of concrete-operational reasoning. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

### ISSUES, PROBLEMS, AND PROCEDURES OF IMPLEMENTATION INVOLVED IN STATE-MANDATED COMPETENCY BASED EDUCATION AND MINIMUM COMPETENCY TESTING PROGRAMS Order No. DA8321245

BUCCIARELLI, DANIEL JOSEPH, ED.D. *Temple University*, 1983. 204pp. Major Adviser: Dr. Chester E. Raun

This study involved the collection, organization and analysis of data related to state-mandated competency based education (CBE) and minimum competency testing (MCT) programs being implemented at the time of the study. Information was categorized according to nine CBE/MCT criteria: definition, goals, student population, funding, areas of assessment, instrumentation, evidence supporting CBE/MCT, accountability and modifications. Analysis of data revealed several patterns among states implementing CBE/MCT programs: (1) a large percentage of states (88%) identified their goals in relation to real life situations; (2) CBE/MCT programs clearly stress cognitive factors and deemphasize affective factors; (3) cognitive factors were more strongly emphasized in relation to Reading/Language Arts and Mathematics than in relation to other academic areas; (4) both higher order and lower order cognitive processes were given approximately equal degrees of stress when the interaction between cognitive processes and academic areas was disregarded; (5) strong regional disagreements existed pertaining to the degree of emphasis placed on the following goals: academic skills unrelated to real life situations; consumer education; citizenship education; career choice and development; physical education; family living; proficiency in music and the arts. While the results of this study indicated the high degree of "dizzying diversity" which Gilman (1978) found among CBE/MCT programs, it now appears that a substantial amount of uniformity exists. The results of this study point to a need for hard evidence in support of CBE/MCT. The majority of respondents supported their programs in terms of subjective judgments rather than in measurable terms such as significantly higher achievement scores.

### A STUDY OF THE RELATIONSHIPS BETWEEN SOCIOECONOMIC CHARACTERISTICS AND ASPECTS OF MATHEMATICAL ACHIEVEMENT OF PRIMARY SCHOOL CHILDREN OF GRADES FOUR AND SIX IN COSTA RICA Order No. DA8300215

BUJAN-DELGADO, VICTOR MANUEL, PH.D. *The Ohio State University*, 1982. 192pp. Adviser: Professor Lorren L. Stull

The purpose of this study was to investigate the relationships between some socioeconomic characteristics and some aspects of mathematical achievement, in problem-solving, for primary school children in grades four and six in Costa Rica.

One thousand one hundred seventy-five school children were selected for this study from twenty-one grade four groups and twenty-one grade six groups from thirty-two schools. These forty-two groups were randomly selected from among the one hundred twenty-seven urban primary schools located in central counties of the seven Costa Rican provinces.

The hypotheses were: (1) students of high socioeconomic status obtain significantly higher scores in arithmetic problem-solving than students of low socioeconomic status. (2) Students of high socioeconomic status obtain significantly higher scores when solving one-step problems without extraneous information than students of low socioeconomic status. (3) Students of high socioeconomic status obtain significantly higher scores when solving one-step problems with extraneous information than students of low socioeconomic status. (4) Students of high socioeconomic status obtain significantly higher scores when solving multi-step problems than students of low socioeconomic status. (5) Students from the province of San José obtain significantly higher scores when solving arithmetic word problems than students from the rest of the country.

Three instruments were used: (1) a problem-solving multiple choice test; (2) a socioeconomic questionnaire; and (3) a teacher and school information questionnaire. The information was analyzed by the statistical techniques of correlation, factor analysis, and analysis of variance.

The findings were: (1) hypotheses 1, 2, 3, and 5 can be supported under the conditions of this study at a level of statistical significance of $p < 0.01$. (2) Answers given to three arithmetic problems taken from NAEP (RA35941K, RA70643, and RA41041) suggest that the ability of Costa Rican fourth and sixth graders to solve arithmetic problems is not significantly higher than the ability of American nine year old school children.

### PROBLEM REPRESENTATIONS AND SOLUTION PROCEDURES USED IN SOLVING ALGEBRA WORD PROBLEMS Order No. DA8229816

BULL, ELIZABETH KAY, PH.D. *University of Colorado at Boulder*, 1982. 198pp. Directors: Associate Professor Verne C. Keenan, Professor Peter G. Polson

The processes used in solving algebra word problems have received attention in both psychological and mathematics education research. These lines of research were reviewed and discussed from an information processing framework which postulates that the fundamental aspect of problem-solving activity is the construction of an adequate representation of a problem. A representation of a mathematical word problem is built upon the problem solver's understanding of the problem text, recall of mathematical and real-world knowledge from long-term memory, and the inferences drawn from the recalled information. The more integrated this representation is, i.e., the more information it contains, the better chance the individual has of solving the problem.

In this research project, the processes that college students used to solve word problems were examined through either written solutions or think-aloud (verbal) reports. The written solutions were scored using a coding system developed to categorize types of solution strategies. There were three general groups of strategies--used non-algebraic strategies (e.g., trial and error, arithmetic operations), wrote an equation based on a partial problem representation, and wrote an equation based on a well-integrated representation of the problem.

A coding system for use with the verbal protocols was also developed. Two scores were calculated from the coded statements to reflect (a) the level of coherence or integration of the problem representation, and (b) the degree to which the parts of the representation corresponded to the demands of the problem, correct mathematical procedures, and real-world knowledge.

Finally, a schematic framework was developed to describe the methods by which subjects attack word problems. This framework was used to evaluate effective and ineffective solution procedures and to pinpoint the types of errors which cause subjects to be unable to solve word problems.

The results of the methodological issues raised in this research were discussed in relation to the following questions. Can reliable solution strategy categories be identified? Can the representational quality underlying mathematical problem solutions be measured quantitatively? What processes discriminate effective from ineffective word problem solutions? How well does the theoretical framework developed in this research explain mathematical problem-solving behavior?

### MICROCOMPUTER TECHNOLOGY IN PUBLIC SCHOOLS IN SOUTHEASTERN MICHIGAN Order No. DA8315580

BURKE, ANTOINETTE MARIE, ED.D. *Wayne State University*, 1983. 184pp. Adviser: Roger A. DeMont

The purpose of this study was to determine the status of microcomputer technology in Southeastern Michigan Public Schools and the implications microcomputer technology will have on educational planning and education. Specifically, the study addressed itself to: (1) determining the status of microcomputer technology in six counties of Michigan--Wayne, Oakland, Macomb, Washtenaw, St. Clair, and Livingston; (2) determining the attitude of educators toward microcomputer technology; (3) determining future plans of school districts in microcomputer technology; (4) determining inservice education needs, courseware needs, type of microcomputers that will be acquired, specific kind of microcomputer features desired, and microcomputer applications that need to be developed; (5) developing recommendations for educational planning and computer use in schools.

Data for this study were obtained from educators' responses to a computing opinion survey. Data were analyzed by crosstabulation to determine if responses differed among school districts using microcomputer equipment, timeshare equipment, or using both microcomputer and timeshare equipment. Other variables were also examined, including the type of school district (rural, suburban or urban) and the wealth of the school district.

Some of the major findings were: Apple, Pet and TRS microcomputers were used for instructional and computer science applications in school districts; the microcomputer features evaluated as most important by the majority of school districts were Basic language, printer and graphics.

The greatest need for instructional development of computing application programs was in the areas of problem solving, computer literacy, and simulation. The greatest need for additional microcomputer applications was in mathematics, science, business education, computer literacy, and computer science. Survey respondents indicated that the greatest need for courseware was in grades 7 through 12.

It was concluded that the use of microcomputers was prevalent in school districts in Southeastern Michigan. Interest in computing will continue to increase, especially as microcomputers become more affordable. School districts were planning to purchase microcomputers and, therefore, the quantity and use of microcomputers in education will continue to increase. There was a strong need for inservice training in educational computing. Educators requested more courseware for their microcomputers in all subject areas, computing applications, and grade levels.

## A STUDY TO IDENTIFY AND EVALUATE DIFFERENCES IN ACHIEVEMENT AND ATTITUDES BETWEEN EXCESSIVELY ABSENT AND NORMAL ATTENDANT STUDENTS AND TO EVALUATE THE PERCEPTIONS OF EXCESSIVELY ABSENT STUDENTS AS TO THEIR REASONS FOR SCHOOL ABSENCE

**Order No. DA8321246**

**Burns, Joseph John, Ed.D.** *Temple University*, 1983. 166pp. Major Adviser: Dr. Robert J. Mahar

The purpose of this study was to investigate differences in achievement and attitudes between normal attendant and excessively absent students and evaluate the perceptions of excessively absent students regarding their reasons for school absence. Since there were two parts to this problem, each was treated separately.

Five null hypotheses were formulated. They hypothesized that membership in either the normal attendant or excessively absent group would not contribute a statistically significant increase in the variance in reading, writing, arithmetic, self-esteem, and interest in school and learning achievement scores, as measured by the *Educational Quality Assessment Inventory*, beyond that already attributable to a covariate set of I.Q., sex, and socio-economic status.

Five research questions guided the investigation of the second part of the problem. The questions sought answers to whether it was the absent students' perceptions that health, difficulty of the school curriculum, home responsibilities, peer pressure to be truant, or other reasons was a cause of school absenteeism.

The study took place in the Ridley School District located in suburban Philadelphia, Pennsylvania. The subjects were sixty eighth grade students. They were divided into normal attendant and excessively absent groups and matched on I.Q., sex, and socio-economic status. The *Educational Quality Assessment Inventory* and an interview instrument were used as measurements.

An *Ex post facto* research design incorporating an analysis of covariance via multiple regression techniques was employed to address the first part of the problem. The second part of the problem was investigated by a descriptive analysis of an interview instrument given to the absent population.

The results indicate there was no significant difference between the two groups in reading and interest in school and learning achievement. The normal attendant students performed significantly better than the absent students in writing, arithmetic, and self-esteem achievement. The excessively absent students saw health, home responsibilities, and fatigue as prime reasons for school absence.

The implications from this study and the literature search are presented. Time-on-task appears to affect subjects that are drill oriented; parents may be delegating child care responsibilities to their children; and strong attendance policies appear to improve attendance.

## A STUDY OF THE EFFECTS OF USING CAI TO TEACH SIGNED NUMBERS TO SEVENTH GRADE GIFTED STUDENTS

**Order No. DA8227441**

**Burrowes, Sharon Kathleen, Ph.D.** *The University of Akron*, 1983. 253pp.

Over the past several decades, educators have been expressing concern over the ways in which the needs of the gifted have been overlooked. In the last few years, the small, inexpensive microcomputer has become available with the potential for solving the cost and availability problems of earlier CAI when educating the gifted. Two hypotheses were examined. Research Hypothesis I stated that mathematically gifted students taught signed number arithmetic using CAI have scores on an achievement test on signed number arithmetic higher than those using tape materials or text materials. Research Hypothesis II stated tht mathematically gifted students taught signed number arithmetic using CAI have scores on an attitude test on signed number arithmetic higher than those using tape materials or text materials. Fifty-four students enrolled in an enriched mathematics program in a small, midwestern junior high school were divided into three treatment groups to study signed numbers. One group used standard teacher-authored text materials, a second used teacher-authored text materials supplemented by cassette tape, and a third used teacher-authored CAI. Students in each treatment group were further subdivided into study groups of three students each. At the completion of the five units, each student took an attitude survey on signed numbers. When all groups had completed the units, an achievement test was administered to all students at once. Although no conclusions could be drawn regarding the attitude or achievement of the subjects in this study, a number of observations of potential interest to future researchers were made. First, informal classroom observation of the students indicated that the non-threatening nature of the microcomputer and the power of color graphics make these new machines potentially powerful learning tools. Further, the classroom teacher could be more actively aware of student progress by attention to the screen at which students are working. Lastly, long-term observation of students who had been involved in CAI indicated that there may be a relationship between exposure to CAI and willingness to use the computer to solve problems. All three of these informal observations lend strength to the movement to incorporate the microcomputer in the classroom and should be researched further.

## AN INVESTIGATION OF THE THREE LEVEL CONSTRUCT OF COMPREHENSION FOR VERBAL MATHEMATICS PROBLEMS

**Order No. DA8300121**

**Burzler, Donald Robert, Jr., Ph.D.** *The University of Connecticut*, 1982. 135pp.

*Problem*. The investigator sought to determine whether student performance on three level comprehension questions for verbal mathematics problems indicated three separate and distinct levels.

*Research Question and Hypotheses*. The study focused on the following research question: Does student performance on questions designed to elicit responses on the six comprehension scales for verbal mathematics problems indicate three separate and distinct levels of comprehension?

Four null hypotheses were addressed: ($HO_1$) There is no significant difference in performance at $p < .01$ level on the three levels of comprehension for the total sample of subjects. ($HO_2$) There is no significant difference in performance at $p < .01$ level on the three levels of comprehension for students with high, middle, and low mathematics problem solving ability. ($HO_3$) There is no significant difference in performance at $p < .01$ level on the six comprehension scales for the total sample of subjects. ($HO_4$) There is no significant difference in performance at $p < .01$ level on the six comprehension scales for students with high, middle, and low mathematics problem solving ability.

*Population*. The population included 118 seventh and 105 fifth grade students from a school district in southeastern Connecticut.

*Procedures*. Six comprehension scales were developed from the three comprehension levels. An instrument was developed to obtain student performance data on the six comprehension scales for ten verbal mathematics problems. The instrument was administered to the sample. Common-factor analyses were carried out to address the research question. Two repeated measures analyses of variance were used to address the four null hypotheses.

*Findings*. (1) Performance on the three levels on comprehension for the total sample and three ability groups provided some support for three separate and distinct levels. (2) Analyses of performance on the six comprehension scales indicated no more than two factors in all cases. (3) Performance on the six comprehension scales for the total sample and three ability groups indicated there were no significant differences between elements of different levels of comprehension.

*Implications*. While analyses of the three levels of comprehension provided some support for three separate and distinct levels, serious questions were raised by analyses of the six comprehension scales.

## THE RELATIONSHIP OF COORDINATED INSTRUCTION, PAST MATHEMATICAL PERFORMANCE, DURATION OF TIME ENROLLED, AND MATHEMATICAL ACHIEVEMENT OF PULL-OUT TITLE I STUDENTS Order No. DA8308667

BUSCAVAGE, THOMAS JAMES, ED.D. *The Florida State University*, 1982. 236pp. Major Professor: Herbert J. Reese

The relationship between Title I procedures, selection criteria, past mathematical performance, and duration enrolled, and mathematical achievement of pull-out Title I students was answered by three research questions: What is the relationship between mathematical achievement and coordinated instruction? What is the result of providing an additional year of Title I services to pull-out Title I students? What is the optimum number of years the Title I program is effective in raising mathematical achievement of pull-out Title I students?

Data collected from the Title I Teacher interview in conjunction with the spring 1980 CTBS, fall 1980 CTBS, and spring 1981 CTBS were analyzed for 450 pull-out students in grades two through six.

A descriptive approach using a multiple linear regression equation subdivided by *b* weights determined the relationship between coordinated instruction and mathematical achievement.

An experimental approach using a *t* test in a pretest-posttest design was used to determine the effect of an additional year.

An experimental design using analyses of variances on the pretest and the posttest determined the optimum number of years a Title I program was effective in raising mathematical achievement.

Data revealed the first two years of enrollment in a Title I program were the optimum years for achievement. The first year of enrollment was more beneficial than the second year of enrollment.

The mathematical achievement of primary students was greater than the mathematical achievement of intermediate students. After two years of enrollment, students showed progress, but to a lesser degree.

An additional year of Title I services sustained, but did not increase, the mathematical achievement of Title I students.

There was improved communication between the classroom teacher and the Title I teacher as a result of coordinated instruction, and there was a relationship, though negligible, between mathematical achievement and coordinated instruction.

## PRESERVICE SECONDARY MATHEMATICS TEACHER'S KNOWLEDGE ABOUT TEACHING MATHEMATICS AND DECISION-MAKING PROCESSES DURING TEACHER TRAINING Order No. DA8228674

BUSH, WILLIAM SPENCER, ED.D. *University of Georgia*, 1982. 244pp. Director: William D. McKillip

The purposes of this study were (1) to identify specific sources of knowledge about teaching, (2) to describe the influence of these sources on preservice teacher's teaching performances and (3) to describe both preactive and interactive decision-making processes of preservice teachers during their teacher training progam.

The subjects of the study were five female preservice teachers enrolled in a secondary mathematics teacher training program. The investigator observed and interviewed these subjects during a methods course for teaching secondary mathematics and during their student teaching experience. Before and after the methods course and after student teaching, the investigator interviewed and tested the preservice teachers with respect to their conceptions and knowledge of teaching mathematics. The investigator also observed the subjects teaching mathematics in three different experiences--microteaching, small group (both during methods course), and student teaching. Selected lessons were observed, and the preservice teachers were interviewed before and after each observed lesson.

From analyses of the lesson plans and interview transcripts, the investigator drew numerous conclusions concerning the five preservice teachers. (1) Before entering the methods course, the preservice teachers knew much about the general teaching behavior of mathematics teachers. (2) The teaching ideas of the preservice teachers were attributed to sources from past school experiences, the methods course, and student teaching. (3) The preservice teachers made three general types of preactive decisions--content, procedural, and objective--and identified numerous bases related to beliefs about teaching, learning, and mathematics for these decisions. The focus of preactive decisions was related to the type of teaching experience. (4) The preservice teachers made many kinds of interactive decisions, and these decisions were based on student, personal, and environmental factors. (5) The preservice teachers tended to use proportionally more and different general teaching behaviors in the methods course experiences than in student teaching. Reasons for this occurrence were offered.

## IMPACT ON PUPILS' ATTITUDE AND ACHIEVEMENT FOLLOWING TRANSFER RESULTING FROM CLOSING A SCHOOL Order No. DA8310812

BYANSKI, THOMAS JOSEPH, PH.D. *Purdue University*, 1982. 70pp. Major Professor: Norbert J. Nelson

This study was primarily initiated to determine if a significant change occurred in academic achievement scores in math and reading of elementary students in grades one through three who moved into a new school setting compared to similar students who did not move. In addition, the degree of correlation between attitude and achievement for the experimental group was determined.

The subjects for this study consisted of 236 students in grades one through three. Of this group, 97 students were relocated because of the closing of a school.

The variables utilized in the study consisted of two dependent variables, achievement, as measured by the *Stanford Achievement Test*, and attitude, as measured by the *School Attitude Measure*. The main independent variable was school condition with grade and sex treated as independent attribute variables.

Results of the univariate analysis of data (ANOVA) indicated that for the study population the closing of a school and subsequent relocation of students did not affect the achievement scores of the students nor did it affect their attitude toward schooling. Although the analysis showed a difference by grade level in both math and reading

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achievement, this could not be attributed to the closing of a school, but, in all likelihood, to history and maturation.

A significant correlation between achievement and attitude could not be established in this study and yet the attitude toward schooling measure for both the experimental and control groups was positive. Since there were no significant declines in achievement, it could be concluded that attitude did not contribute negatively to achievement.

The implication of the results of this study rests in the argument that can now be made. This argument in effect suggests that the relocation of students because of school closing does not adversely affect student achievement.

## A DESCRIPTIVE STUDY OF MATHEMATICS ANXIETY: ITS NATURE AND ANTECEDENTS Order No. DA8300843

Byrd, Pamala Gulley, Ph.D. *Indiana University*, 1982. 194pp.

Mathematics anxiety has been associated with poor mathematics performance and avoidance of mathematics, both of which have implications for future careers. The purpose of this study was to begin the generation of theory on the nature and antecedents of mathematics anxiety. The theory was generated through a synthesis of grounded data and previously formulated theory on general, test and mathematics anxiety. Grounded data were obtained from a series of in-depth interviews with each of six respondents; four high mathematics-anxious and two low. Each interview was audiotaped and transcribed and the transcripts were analyzed. Other qualitative methods were used to establish trustworthiness of the research.

Mathematics anxiety was defined as a specific experience of anxiety in situations involving mathematics. However, there also seemed to be a more pervasive form of mathematics anxiety which was closely related to avoidance of mathematics. Mathematics test anxiety was found as well as mathematics anxiety in nontesting situations. The cumulative nature of the subject and the lack of context as in reading partly explained why mathematics was anxiety provoking.

Three types of antecedents of mathematics anxiety were explored; ones related to the personality or disposition of the individual, ones related to the situation, and ones related to the environment of the individual in the past. The dispositional antecedents included confidence in ones ability to do mathematics, doubt about self as a person, need for approval, need to achieve, attitudes toward mathematics, factors related to intellectual functioning, and self blame. Situational antecedents included the way mathematics is taught, personality of the teacher, classroom or school factors, and antecedents of test anxiety. Finally, environmental antecedents included sociological factors such as socioeconomic status, parental factors, and sex role socialization.

## A STUDY OF THE EFFECTS OF THE ESSENTIAL ELEMENTS OF INSTRUCTION MODEL ON MATHEMATICS ACHIEVEMENT Order No. DA8319232

Canady, Sharon Markham, Ed.D. *Northern Arizona University*, 1983. 104pp. Adviser: Eddie E. Sage

The purpose of this study was to research the effects of a specific instructional model called the Essential Elements of Instruction Model, which is often referred to as EEI, and its effects on mathematics achievement in elementary school grades. Chapter 1 included an overview of the study with a brief discussion of the history of research on quality instruction, the purpose of the study, statement of the problem, limitations of the study, and definition of terms. Chapter 2, the review of the literature, was divided into three sections. Section I described the history of research on effective instruction. Section II included descriptions of instructional models that were designed to utilize research proven strategies. Included in this section were Bloom's Mastery Learning Models, the Beginning Teacher Evaluation Study's Academic Learning Time Model and Rosenshine's Direct Instruction Model. Section III included the background and complete description of the EEI Model based on Hunter's Clinical Theory of Instruction. Chapter 3 included a restatement of the problem, purpose of the study as well as a description of the procedures for the implementation of the study.

As a result of the research conducted and reported in Chapter 4 of this study, a number of conclusions were drawn: (1) The EEI Model significantly affects scores on mathematics computation skills, mathematics application skills, and total mathematics achievement; (2) Students from grades four, five and six treated with the EEI Model achieve significantly higher scores in mathematics computation skills, mathematics application skills, and total mathematics achievement; (4) students from grades three, four, and six treated with the EEI Model achieve significantly higher scores in mathematics application skills; (3) Male and female students treated with the EEI Model achieve equally in mathematics computation skills, mathematics application skills and total mathematics achievement.

Recommendations were made in Chapter 5 of this study. They included the encouragement of the inclusion of the EEI Model in staff development programs and university education classes. Suggestions were also made for further study in other grade levels and other subject areas.

## A STUDY OF THE ADMINISTRATION OF STATE-FUNDED GIFTED/TALENTED PROGRAMS IN TEXAS Order No. DA8323487

Cannon, Carol, Ed.D. *East Texas State University*, 1983. 183pp. Adviser: Ruth Ann Stephens

*Purpose of the Study*. The purpose of this study was to determine how the 114 single district or cooperative Gifted/Talented (G/T) state-supported programs were being administered in Texas in 1982-83. This study included the functions of the G/T administrators as identified by the participants and the problems involved with the implementation and administration of a G/T program.

*Procedure*. Data were collected by using a three-part questionnaire, and the questionnaires were sent to 114 G/T administrators in Texas. The data from the ninety-two participants were coded and hand tabulated. Percentages were calculated and the data were presented in tables where appropriate.

*Findings*. Ninety-two Texas G/T administrators indicated that their single or cooperative districts offered G/T programs; the average period of implementation was 4.2 years. All grade levels were served with the largest number of programs implemented in the fourth, fifth, and sixth grades. Language arts instruction was included in most of the G/T programs. The G/T directors indicated that using an intelligence test was a criterion for selection of G/T students; the percentile ranking on standardized achievement tests in the areas of math and reading was also being utilized.

A substantial majority of the G/T directors reported that the administrators had input into the budget process affecting the program. Eighty-seven administrators indicated that local funds were used partially to finance the G/T program; the average percentage for local funding of G/T programs was 61 percent.

*Conclusions*. The data from this study supported the following conclusions: (1) There is a shortage of well-trained teachers for G/T programs. (2) G/T workshops are the most common method of training G/T administrators. (3) There is a need for an increased number of college courses in gifted education throughout the state for teachers and administrators. (4) State monies are insufficient to finance G/T programs.

## THE EFFECT OF SCHOOL ENTRANCE AGE ON ACHIEVEMENT AND ADJUSTMENT Order No. DA8301566

Carrington, Mary Ann, Ed.D. *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 169pp. Chairperson: Maurie Hillson

The major purpose of this study was to find out if differences in school entrance age affected the academic achievement of students in the first, third, and sixth grades and the social adjustment of students in kindergarten through sixth grades.

*Conclusions*

*Achievement*.--Age of entrance appeared to be a highly significant factor affecting the performance of students in language and mathematics in the first grade.

The data indicated, however, that by the time students reached that third grade, entrance did not provide an educational advantage or disadvantage.

Examination of the test data revealed that the performance of the oldest students was in many cases not better than the performance of the normal-age and younger-age students. In fact, in the sixth grade, the older-age students achieved below the levels of the four younger age groups in language and mathematics. Age did not have a significant effect on reading achievement at any grade level.

The results of the correlation tests showed that the relationship between age, calculated in continuous intervals, and achievement was weak and inconsistent for each of the three academic variables and in each of the three grade levels.

*Adjustment*.--Inspection of the adjustment data indicated that entrance age did not affect the social adjustment of students.

*Appraisal*

This study showed that early entrants made excellent progress as they advanced in school and clearly supported the practice of early admission for preschoolers with average readiness skills.

The findings of the study with respect to the progress of older-age entrants raised questions about the efficacy of delaying school entrance. Although the evidence was not sufficient to justify conclusions or support recommendations concerning the practice of delayed entrance as an alternative to early admission, it did indicate the need for further investigations of this practice.

Many factors affect the progress of students in school, and while chronological age may be among these factors, it appears from this study that its influence is minimal, if not negligilbe, in the long run.

## PREDICTING STUDENT PERFORMANCE IN ENTRY LEVEL ELECTRICAL ENGINEERING TECHNOLOGY AND MATHEMATICS COURSES USING PRECOLLEGE DATA

**Order No. DA8324524**

**Case, Jeffrey Dean**, Ph.D. *University of Illinois at Urbana-Champaign*, 1983. 183pp. Adviser: Dr. Rupert N. Evans

The major problems of this study were to identify the relationships between precollege variables and performance in entry level courses in technical curricula through the formation and testing of equations which predict final course grades, and to compare two algorithms for selecting subsets of regression variables. The study examined the problems through efforts to update, improve, extend, and validate methods used at Purdue University Calumet for predicting grades in entry level collegiate courses while describing the improved procedures in a way which would assist officials at other institutions with similar interests.

The population consisted of students who enrolled in certain entry level courses in the departments of Mathematical Sciences and Electrical Engineering Technology at Purdue University Calumet between June, 1979 and June, 1982. Precollege data formed the independent variables. The dependent variable was the final grade in the courses studied.

Multiple regression analysis followed by cross validation was the principal technique. Stepwise analysis and optimal subset selection were investigated as methods for selecting the best subset of the independent variables.

The variables found to be the best predictors of performance in entry level mathematics courses are: mathematics SAT scores, high school grade average, the product of high school mathematics semesters and high school average grades in mathematics, high school science grade average, high school mathematics semesters, and age. The variables which were found to be the best predictors of performance in EET 102 are: high school science grade average, age, the number of semesters of high school science, and performance in prerequisite and corequisite mathematics courses.

It was found that the accuracy of predictors increased with increasing course rigor. Predictors were least successful for courses whose students were primarily majors in technical curricula.

The optimal and stepwise regression methods led to essentially identical results with negligible computational cost differences.

## A STUDY TO DETERMINE THE EFFECTIVENESS OF RATIONAL-EMOTIVE AFFECTIVE EDUCATION UPON THE ACADEMIC ACHIEVEMENT OF SIXTH-GRADE CHILDREN

**Order No. DA8300079**

**Casper, Ellen Frances**, Ph.D. *University of Virginia*, 1981. 218pp.

This study was begun for the purpose of determining whether a program in humanistic education, Rational-Emotive Education, could significantly increase academic achievement when compared to pupils receiving academic drill training, at the .05 level of confidence. A second purpose of the study was to provide additional data regarding the controversy surrounding humanistic education vs. traditional educational approaches to more effectively educating the child.

The sample consisted of 80 sixth-grade boys and girls in a suburban Cleveland, Ohio elementary school. Subjects were randomly divided into four groups: (I) Rational-Emotive Education; (II) Academic Training; (III) Attention-Placebo; and (IV) Control. Group I received lessons in Rational-Emotive Education, based on Rational-Emotive Psychotherapy, designed to develop increased self-awareness and ability to solve life problems more effectively. Subjects in Groups I, II, and III were seen in treatment once a week for 60 minutes for 12 weeks.

Subjects were pre and posttested on the mathematics section of the California Achievement Test (CAT, 1977), the Piers-Harris Self-Concept Scale and the Children's Survey of Rational Concepts (CSRC). Subjects were also evaluated by teachers prior to and following treatment using the Coopersmith Behavioral Academic Self-Esteem Scale (BASE).

Results were analyzed by analysis of variance on dependent measures for each of the experimental groups. There were no statistically significant differences between treatment conditions on measure of academic achievement. Results on measure of rational content acquisition indicated statistically higher scores for subjects in the REE group. No statistical differences were indicated between groups on the REE efficacy measure of self-esteem.

Scores on the teacher ratings of classroom behavior were statistically higher for the REE group. Post hoc analyses for high and low-esteem subjects pointed to high-esteem youngsters scoring significantly better than low-esteem subjects on the test of rational-emotive content acquisition. Multiple regression analyses determined that combined pretest scores of CSRC and BASE were excellent predictors of mathematics achievement for subjects in this study.

Results regarding the efficacy of an affective program such as REE and its relationship to academic achievement are inconclusive and require further investigation.

## A SURVEY OF STUDENT STUDY HABITS AND ATTITUDES TOWARD SCHOOL

**Order No. DA8310038**

**Cavanaugh, Robert**, Ph.D. *The University of Iowa*, 1982. 158pp. Supervisor: Professor George A. Chambers

The problem of this study was to determine if students who differ in gender, grade level, grade point average, extra class participation, planned course work beyond graduation requirements, post high school plans and employment status, also differ in their study habits and attitudes toward school.

*Procedures*. Students in grades nine through twelve from a metropolitan midwest community comprised the population of the study. A stratified random sample of 509 students, representing about 10% of the population, was administered the Student Study Habits and Attitudes Survey (SSHA, Psychological Corporation) and completed a demographic information form containing the items related to the research problem. ANOVA and t-tests were utilized to compare the means of groups. An alpha level of .05 was employed to test the difference between means.

*Findings and Conclusions*. Females scored higher than males on the SSHA when the means of both groups were compared. Student grade level comparisons indicated that, regardless of grade placement, study habits and attitudes toward school were similar.

Analysis of student scores by class rank and grade point average indicated that students in the upper quarter of the class and students with grade point averages between 3.51 and 4.00, scored highest on the SSHA.

Whether a student was employed or not employed had a minimal effect on his/her SSHA score. Students who had taken course work beyond graduation requirements in the English, mathematics, natural science, foreign language and social studies areas, scored higher on the SSHA than students who met only the graduation requirements in those areas.

Seventeen extra class activities were compared on a participant-non participant basis. Students involved in community service, interscholastic athletics, publications and student government scored significantly higher than students not participating in those activities. The remaining activities displayed no differences in mean SSHA scores between participants and non participants.

Students planning to attend a college/university scored higher on the SSHA than students with other plans. Students with no plans following high school and those students planning to get jobs immediately following graduation, scored lowest on the SSHA.

### THE RELATIONSHIP OF PUPIL CONTROL ORIENTATION TO PUPIL ACADEMIC ACHIEVEMENT Order No. DA8323359

Childers, Robert William, Ed.D. *The University of Tulsa*, 1983. 56pp. Director: Professor Victor O. Hornbostel

The purpose of the present study was to examine the relationship of Pupil Control Orientation (PCI) and student achievement. The PCI of a school is a climate measure that describes the school in terms of a continuum from humanistic to custodial. A humanistic school is basically an open, democratic climate that stresses the needs of the individual student. A custodial school is the traditional school that is rule centered, has a highly controlled atmosphere, and is primarily concerned with maintenance of order.

The basic hypothesis of this study was that a humanistic PCI climate will relate to academic achievement. Sixty-five elementary schools and 125 teachers from the Southwestern Union of Seventh-day Adventists school system were involved in this study. The teachers and principals were assessed using the PCI, and achievement was assessed with the Iowa Achievement Test for Basic Skills. Four achievement areas (Language, Workstudy, Math and Composite) at both the 4th and 8th grade levels were used to measure student achievement. Pearson correlation coefficients were calculated to measure the relationship of the school PCI with achievement in these 8 areas of achievement.

None of the 8 hypotheses were supported relating humanism in PCI to achievement. Although in some instances (i.e., workstudy--fourth grade and composite--fourth grade) custodialism had significant ($p < .05$) relationships with achievement. However, the results of the present study indicated that there was little, if any, relationship between PCI and achievement.

### AN INVESTIGATION OF THE RELATIONSHIP BETWEEN COGNITIVE DEVELOPMENTAL STAGE AND QUANTITATIVE SKILLS IN COLLEGE STUDENTS Order No. DA8321614

Christianson, Deann Julie, Ed.D. *University of the Pacific*, 1983. 155pp.

*Problem*. The purpose of this study was to investigate the relationship between Piagetian cognitive developmental stage and quantitative skill levels, as measured by placement tests, in college students taking introductory level mathematics courses.

*Procedure*. Data were collected from students enrolled in self-paced remedial/developmental courses in pre-algebra, elementary algebra, intermediate algebra and regular courses in statistics and elementary functions at the University of the Pacific in the Fall 1982 semester. The Descriptive Test of Mathematical Skills (DTMS) was used to place students. Demographic data collected were sex, age and number of high school mathematics and science courses taken. Bond's Logical Operations Test (BLOT) was used to classify the cognitive stage of the students. The Kurtz/Karplus group test of Piagetian stage was also given to students in the remedial/developmental class. At the end of the semester, the BLOT and DTMS were re-administered to students in the remedial/developmental class. A matched pair design was used to analyze DTMS and BLOT gains for students given special problem-solving instruction. Gains in DTMS scores by cognitive level were tested using a covariate analysis. Contingencies between sex, cognitive level, placement level and number of high school science and mathematics courses were investigated.

*Findings*. Significant relationships existed between mathematics placement level and Piagetian stage with students placed at higher levels having higher mean cognitive assessment scores. Gains in mathematical skills in the remedial/developmental course were related to cognitive stage. No gender differences were found in mean DTMS or BLOT scores. Gender differences favoring males were found in number of mathematics courses taken and the Kurtz/Karplus test scores. The experimental problem-solving instruction was successful in raising gains in DTMS scores but not BLOT scores. There was a 30% exact agreement between the two cognitive assessment instruments used.

*Conclusions*. College instructors should recognize that in lower placement levels in mathematics all students may not be formal operational and thus, the traditional lecture format may not be appropriate for these classes. Activities which encourage the development of formal thought should be added to remedial/developmental courses. More research is needed on group assessment instruments which categorize college students as concrete or formal operational.

### MICROCOMPUTER BASED REMEDIATION STRATEGIES FOR SUBTRACTION Order No. DA8319379

Clark, Jeffrey, Ph.D. *The University of Utah*, 1983. 96pp. Chairman: J. Blair Stone

The purpose of this study was to investigate whether providing diagnostic information about subtraction errors was more beneficial than giving students information about the correct procedure. Students ($N = 1,202$) in the third, fourth, and fifth grades were given a 50-item subtraction test. The test was designed to identify students who were making two kinds of systematic errors. After the subjects were identified ($N = 90$), they were randomly assigned to one of three feedback treatment conditions. This resulted in a 2 x 3 (systematic error x feedback) factorial design. Subjects were given subtraction problems and their respective feedback messages via Apple II computers. Each subject received 8-minute practice sessions for five consecutive days. Immediately following the fifth session subjects received a posttest. One week later a delayed retention test was given. Results indicated there were no significant differences between groups receiving different forms of feedback. Further analysis revealed that the systematic errors were not stable over time and the amount of feedback the subjects received was less than 3% of the total number of trials. In spite of the low frequency of feedback, subjects made significant improvement ($p < .01$) from the pretest to the posttest. It was concluded that knowledge of results feedback may improve subjects' performance on subtraction problems.

### THE EFFECTS OF EMPIRICAL COUNTING, DEVELOPMENTAL LEVEL, AND SET SIZE ON CHILDREN'S CONSERVATION PERFORMANCE Order No. DA8312339

Coburn, Marlene, Ph.D. *City University of New York*, 1983. 87pp. Adviser: Professor Geoffrey Saxe

The purpose of this research was to analyze factors that influence children's use of counting to solve conservation problems. Two studies were conducted. In Study 1, two groups of nonconservers, one who demonstrated the ability to establish one-to-one correspondences to determine numerical equivalence and one who did not, were presented with one of two sets of four trials, one that consisted of a small and the other a larger set size. In Study 2, two groups of conservers, one who provided more mature explanations for conservation judgments and one who provided less mature explanations, were presented with one of two sets of six number conservation trials, one that consisted of a small and the other a larger set size. In both studies, following standard conservation assessment trials, children were asked to count the sets and then make another conservation judgment. For nonconservers, counting produced evidence of conservation. For conservers, counting produced evidence of apparent nonconservation, achieved by a surreptitious addition or subtraction of an item during the spatial transformation.

Results indicated that nonconservers who understood the numerical significance of one-to-one correspondence were able to make use of counting information to solve conservation problems involving larger set sizes to a greater extent than those who did not understand the numerical significance of one-to-one correspondence relations. In addition, the results revealed that nonconservers who did not demonstrate the ability to produce one-to-one correspondence used counting information to form conservation judgments to a greater extent on small than on large number conservation trials. The two groups of conservers did not differ in their ability to recognize and/or explain the evidence of apparent nonconservation. However, conservers who gave less mature justifications were more able to recognize and/or explain the apparent nonconservation on small than on larger number conservation trials.

The results are discussed with respect to factors that constrain the role of empirical operations, such as counting, in the child's formation of logical concepts, such as conservation. The implications for the present findings for models of counting/number conservation relations are also discussed.

## COGNITIVE DEVELOPMENT IN COLLEGE FRESHMEN: A COMPARISON BETWEEN PERRY'S MODEL OF INTELLECTUAL AND ETHICAL DEVELOPMENT AND PIAGET'S THEORY OF FORMAL OPERATIONS

**Order No. DA8321046**

COIL, ANN PETERSON, PH.D. *Claremont Graduate School*, 1983. 263pp.

The primary purpose of this project was to determine if, and the degree to which, Piaget's theory of formal operations and Perry's theory of ethical and intellectual development account for different types of cognitive development. Seventy-three subjects were administered paper-and-pencil tests to measure performance on Piagetian Tasks, Positions on Perry Scheme and interest and activity in Arts and the Sciences.

The study was a correlational design. Descriptive analysis indicated that most students (82%) scored at the transitional level on formal operational tasks. The mean score for Perry rating on the Measure of Intellectual Development (MID) was 2.96 for Essay A; 3.13 for Essay B; and 3.05 for Essay A and B total.

Perry Essay A (Describe a best class) correlated significantly and consistently with interest in the arts, verbal SAT and with abstract verbal Piagetian task only (Analogies and Abstractions). Conversely Perry Essay B (Describe an important decision) showed significant and consistent correlations with science, science orientation, math SAT scores, and formal operational tasks.

The patterns reported for both Essay A and B were intensified when correlations were computed for those students declaring, math, science, engineering, or medicine as a major and/or career goal and for a group of students who did *not* declare math, science, engineering or medicine as either a major or career goal. Performance on measures of cognitive development do seem to be related to interest and activities.

Based on evidence in this study, it was speculated that Essay B which correlated significantly with formal tasks involving combinatorial logic and isolation and control of variables, accounted for a convergent mode of thinking, characteristic of Perry's level Five, that enabled an individual to arrive at decisions through a systematic analysis and weighing of variables.

Essay A did not correlate with formal operations and was associated with more divergent thinking employed in the analysis and appreciation of the arts and with mature, constructive thinking required to establish an identity, develop a philosophical framework by which to live and make commitments, and forge a life plan. Essay A was hypothesized to be associated with the thinking characteristic of Perry levels Six, Seven, Eight, and Nine.

## COMPUTER SUPPORTED PROBLEM SOLVING IN SECONDARY ADVANCED MATHEMATICS

**Order No. DA8227637**

COLLENBACK, LOYCE LEE, PH.D. *The University of Texas at Austin*, 1982. 126pp. Supervisor: Ralph W. Cain

The purpose of this study was to investigate the relationship between the problem-solving performance of high school trigonometry students and the degree of their exposure to computer programming. The ninety-eight subjects completing the treatments during the fall 1981 semester were enrolled in four regular or enriched trigonometry classes in a suburban public high school of 2300 enrollment.

Two of the classes, one regular and one enriched, served as the experimental group and were exposed to computer programming through study of a unit on the BASIC computer language and regular assignments throughout the semester requiring the utilization of student-developed computer programs. The control group received the regular instructional method, with no such computer programming experience in class.

A pretest (PS1) and a posttest (PS2) of problem-solving ability were developed by the investigator after pilot testing 45 problems and submitting the collected data for Rasch analysis via the Partial Credit model. A computer programming knowledge test (CP) was developed by the high school's computer coordinator to ascertain the subjects' awareness of computer programming processes.

Four hypotheses were tested using a combination of analysis of covariance, analysis of variance, and descriptive statistics. No evidence was found to support the conjecture that subjects with computer programming experience outperform those with no such experience in problem-solving situations. Neither was there evidence to be found supporting a relationship between one's problem-solving performance and his or her computer programming knowledge, as measured by the CP test.

## AN INVESTIGATION OF THE EFFECTS OF MIGRATION ON SELF-CONCEPT, ATTITUDE TOWARD MATHEMATICS AND ACHIEVEMENT IN MATHEMATICS AMONG PUERTO RICAN RETURN-MIGRANT STUDENTS AND PUERTO RICAN STUDENTS WHO HAVE NEVER MIGRATED

**Order No. DA8300749**

COLON COLON, JESUS, D.ED. *The Pennsylvania State University*, 1982. 145pp. Adviser: Joseph O. Prewitt-Diaz

The purpose of this study was to investigate the differences that may exist between self-concept, attitudes toward mathematics, cultural adjustment, and actual achievement in mathematics among Puerto Rican return-migrant students and Puerto Rican students who have never migrated. Another purpose of this study was to determine the effects of migration among the Puerto Rican return-migrant students. The study also intended to determine if there were differences among Puerto Rican return-migrant students and Puerto Rican students who have never migrated in achievement in a language free skill subject; mathematics.

The sample consisted of 416 tenth, eleventh, and twelfth grade students of a high school in the central region mountains of Puerto Rico. One hundred and fifty return-migrant students and two hundred and sixty-six students who had never migrated participated in the study. The students were administered the *Piers-Harris Children's Self-Concept Scale*, the *Suydam-Trueblood Attitudes Toward Mathematics Scale*, the *Cultural Adjustment Scale*, the *Coopersmith Self-Esteem Inventory*, and a measure of the perception of social environment. Mathematics achievement scores were obtained from the Island-wide yearly administration of the *Prueba de Habilidad General*.

An analysis of variance was used to determine the differences in means needed to test the hypotheses concerned with the aforementioned variables. Multiple linear regression analysis was used to determine the possible predictive values of the three independent variables, self-concept, attitudes toward mathematics, and cultural adjustment on mathematics achievement. A correlation statistical test was used to determine relationships between the four variables among Puerto Rican return-migrant students and Puerto Rican students who have never migrated.

Significant differences were found between the Puerto Rican return-migrant students and the Puerto Rican students who have never migrated with regards to self-esteem and perception of the social environment. Significant differences were also found in self-concept, self-esteem, and perception of the social environment between the Puerto Rican return-migrant females and the Puerto Rican females who have never migrated.

Puerto Rican return-migrant students indicated no significant differences in the achievement of a language free skill subject, mathematics. The self-esteem inventory was the best single predictor of mathematics achievement. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

### PREDICTING MATHEMATICS ACHIEVEMENT OF GIFTED ADOLESCENT FEMALES Order No. DA8228677

Cramond, Bonnie Louise, Ph.D. *University of Georgia*, 1982. 83pp. Director: Dr. Catherine Bruch

This study investigated the abilities of two cognitive variables and seven affective variables to predict mathematics achievement of gifted adolescent females. The cognitive variables studied were spatial visualization and flexible thinking. The affective variables included a measure of sex-role identification, and six attitudes toward mathematics (confidence, usefulness, attitude toward success, effectance motivation, and perceived attitudes of mother and counselor).

Eighty-eight girls in eighth grade and 132 twelfth-grade girls participated in the study. The participants had been identified as gifted by the New Orleans Public School System.

Participants were administered the *Differential Aptitude Test-Space Relations*; the *Torrance Test of Creative Thinking-Demonstrator form*; the *Bem Sex Role Inventory*; and selected scales from the *Fennema-Sherman Mathematics Attitudes Scales*. Scores on these measures were entered into a stepwise multiple regression formula with the total score on the Arithmetic Skills Test of the *Comprehensive Test of Basic Skills* as the criterion variable. Separate regression equations were computed for each grade level.

Spatial visualization and attitude toward success were the only significant predictors of mathematics achievement at the eighth grade level ($p < .05$). Together they accounted for 31% of the variance in the criterion variable.

For the twelfth-graders, the significant predictors were spatial visualization and students' perceptions of their counselors' attitudes toward them as learners of mathematics. These two variables accounted for 38% of the variance in mathematics achievement for the seniors ($p < .05$).

An additional analysis was undertaken to discover how the regression equations would be changed with the applications subtest of the CTBS as the criterion.

For the eighth-graders, flexibility, spatial visualization, confidence, and mother's attitude accounted for 38% of the variance in mathematics applications ($F = 12.60$, $p < .001$). For the seniors, 38% of the variance in the criterion variable was accounted for by spatial visualization, counselor's attitude, and femininity ($F = 24.59$, $p < .001$).

The results of this study indicate that cognitive and affective variables may be related to mathematics achievement for gifted adolescent females. As these variables are subject to intervention, the responsibility of the schools to increase females' participation and achievement in mathematics is seen as critical.

### A COMPARISON OF TWO COMPUTER ASSISTED INSTRUCTION MANAGEMENT SYSTEMS IN REMEDIAL MATH. [RECORD OF STUDY] Order No. DA8306839

Crenshaw, Harrison Manley, II, Ed.D. *Texas A&M University*, 1982. 118pp. Chairman: Dr. John R. Hoyle

The purposes of this study were fourfold: (1) to determine whether the laboratory or in-class method of instructional management for Computer Assisted Instruction (CAI) is more effective in providing drill and practice on the concepts of the Bryan ISD Basic Mathematics Program, (2) to determine which CAI system creates a more positive environment from the teachers' standpoint, (3) to determine which system creates a more positive environment from the students' standpoint for CAI, and (4) to determine which system proved to be more cost-effective.

To pursue this study two primary groups of students were chosen, one group had CAI instruction on microcomputers, while the other group used a Computer Curriculum Corporation (CCC) system. Microcomputer instruction was an in-class management system, whereas the CCC program utilized the laboratory method. Levels of achievement were collected on each student in the samples from math profile sheets which indicated progress through the curriculum based on the results of criterion referenced tests. The average number of levels achieved by each group was then compared by using a t-test. The findings of this part of the study showed that there was no significant difference between the two systems in terms of academic achievement.

To pursue the second and third parts of this study, instruments were designed to assess the classroom climate in relation to CAI instruction. Overall the results showed that teachers preferred the in-class management system of the microcomputers.

The students showed no overall preference for either system. Both groups felt successful on their particular system but felt management and scheduling were better handled by the microcomputer system.

Finally a cost-benefit ratio was calculated for each system. It was found that the microcomputer system was more cost-effective.

Based on the findings, the following major recommendations were made: (1) The Bryan Independent School District (BISD) should implement the microcomputer system of CAI. (2) The BISD should begin using microcomputers in all disciplines. (3) A complete drill and practice microcomputer program in mathematics should be designed.

### AN EXPLORATORY CASE STUDY OF THE RELATIONSHIP BETWEEN LOCUS OF CONTROL AND ACHIEVEMENT TEST SCORES AND RACE IN TWO GEORGIA PUBLIC SECONDARY SCHOOLS Order No. DA8320077

Culbreath, John Willie, Ed.D. *University of Georgia*, 1983. 118pp. Director: Kenneth Matthews

This study was designed to investigate relationships between the locus of control scores and the achievement test scores of students in two Georgia secondary schools. The study was also designed to test the differences between the mean scores for black students and for white students on both the Rotter I-E scale and the California Achievement Test. Results were sought which would offer answers to the following questions: (1) To what extent are achievement test scores related to locus of control scores? (2) Are there differences between the locus of control scores of black students and the locus of control scores of white students? (3) Are there differences between the achievement test scores of black students and the achievement test scores of white students?

For the 320 students who responded in this study the Pearson *r* correlation coefficients between locus of control scores and achievement test scores were statistically significant ($p < .001$) for the total California Achievement Test, the reading subtest and the mathematics subtest. Results were also analyzed according to the race of students, their free-lunch eligibility and their school of residence. This total included 216 students who received free or reduced-price lunches and 104 students who paid the full price for their lunches. There were 227 black students and 93 white students. There were also 159 students from School A and 161 students from School B. The separate correlations were strongest for black students who received free or reduced-price lunches, and for white students who paid the full price for their lunches.

The instruments used in this study were the Rotter I-E scale and the California Achievement Test. The data were analyzed using the Pearson *r* product moment correlation and the *t* test for independent means.

Locus of control scores are associated with achievement test scores. Where students received low (internal) scores on the Rotter I-

E scale they tended to receive slightly higher scores on the California Achievement Test than students who received high (external) scores on the Rotter I-E scale. Black students in this study received slightly more external I-E scores than white students. California Achievement Test scores for black students were substantially lower than those of white students.

### COLLABORATIVE CHANGE AMONG MATHEMATICS TEACHERS TO IMPROVE THE MATHEMATICS PERFORMANCE OF GIRLS: A CASE STUDY

**Order No. DA8319878**

**CURTIN, SUSAN ELIZABETH HARRIS, ED.D.** *Boston University School of Education*, 1983. 219pp. Major Professor: Mary H. Shann

The major concerns of this study were to describe the collaborative efforts of a voluntary group of secondary mathematics teachers to develop ways of increasing girls' participation and achievement in mathematics, and to trace the process of collaborative change as it developed naturally among the members of the participant group.

Recognition of the key importance of the mathematics teacher in promoting girls' participation and achievement in mathematics, combined with knowledge of the power of the school culture to enhance or inhibit change, led to the choice of a voluntary, collaborative model of change with the participant teachers. An ethnographic or participant observer methodology was employed so that qualitative observations made during the progress of the study would deepen understanding of how change occurs among mathematics teachers as well as how to intervene in schools to improve girls' performance in mathematics.

The subjects in this study were nine middle and high school mathematics teachers. The subjects met for six three-hour meetings which were taped and transcribed. Notes from three follow-up meetings combined with the transcriptions constituted the study's data pool. Examination of the data revealed a rich, complex series of twenty-one themes which were grouped into seven cluster themes. From these cluster themes emerged two organizing principles, Teachers in Stasis and Teachers in Change, which characterized the subjects' perspectives of their relationships with other school professionals, their relationships with students, and their relationships with parents.

Discovering that the female students did not perform as well as the male students in mathematics, the study participants designed a plan of action which included the preparation and publication locally of four articles to inform parents of the need to support their daughters in mathematics. The plan of action was not fully realized when traditional pressures of the separate school settings ended the participants' collaboration. The collaborative model of change and the participant observer methodology were found to have limited usefulness to induce change in the short run in teachers' perspectives regarding ways to improve girls' performance in mathematics. A list of factors likely to enhance future similar interventions with mathematics teachers was developed.

### AN EXAMINATION OF BLIND CHILDREN'S BRAILLE SYMBOL KNOWLEDGE IN THE AREAS OF READING AND MATHEMATICS

**Order No. DA8306160**

**CZERWINSKI, MICHAEL HENRY, ED.D.** *The Florida State University*, 1982. 193pp. Major Professor: Gideon R. Jones

The purpose of the study was to examine the braille symbol knowledge of blind children in the areas of reading and mathematics. Two braille tests were developed and field-tested on 40 blind subjects from New Jersey. All of the students read braille, attended local school programs, and used reading and mathematics materials on grade levels one through nine.

Through Spearman rank correctional analyses, it was discovered that blind children's braille symbol knowledge for reading was significantly related to the grade level of their reading books for grades one through six, but not for grades seven through nine. The analyses also showed that blind children's braille symbol knowledge for mathematics was significantly related to the grade level of their mathematics textbooks for grades one through nine.

In addition, the percentage of braille signs known by blind students at each of the grade levels was determined along with the braille signs themselves for both reading and mathematics during the study. The percentages were based upon a correct response on the braille tests by 75% or more of the subjects at each grade level.

### THE RELATIONSHIP BETWEEN THE *ACT ASSESSMENT* AND THE *ETS TESTS OF GENERAL EDUCATION* AS MEASURES OF BASIC SKILL LEVELS OF BALL STATE UNIVERSITY SECONDARY TEACHER EDUCATION CANDIDATES

**Order No. DA8315166**

**DALLMAN, MARY ELLEN, ED.D.** *Ball State University*, 1983. 141pp. Chairperson: Dr. Donald W. Jones

The purpose of this study, conducted Spring Quarter, 1982, at Ball State University, was to examine three related problems which are presented as research questions.

(1) What relationship exists between the "English Usage" subtest of the *ACT Assessment* and the "Written Communication" subtest of the *ETS Tests of General Education*? (2) What relationship exists between the "Mathematics Usage" subtest of the *ACT Assessment* and the "Mathematical Thinking" subtest of the *ETS Tests of General Education*? (3) How well do the *ETS Tests of General Education* correlate with a variety of descriptors which are used to measure the basic skill levels of secondary teacher education candidates at Ball State University? The sample consisted of 147 students enrolled in the first course in the professional preparation sequence for junior high/middle school and secondary teacher education candidates.

*Major Findings*. (1) The *ETS Tests of General Education* "Written Communication" subtest, Form 18, does not appear to be a reliable substitute for the "English Usage" subtest of the *ACT Assessment* as a measure of the written communication basic skill levels. (2) The *ETS Tests of General Education* "Mathematical Thinking" subtest, Form 28, does not appear to be a reliable substitute for the "Mathematical Usage" subtest of the *ACT Assessment* as a measure of the mathematics basic skill levels. (3) Correlations revealed that none of the following descriptors: sex, credit hours completed, curricular code, *Scholastic Aptitude Test* scores, high school rank, or college grade-point average, would act as a single, accurate predictor of basic skill levels.

*Conclusions*. (1) Use of *ETS Tests of General Education*, Form 18, "Written Communication," to measure the written communication basic skill levels of secondary teacher education candidates is questionable. (2) Use of *ETS Tests of General Education*, Form 28, "Mathematical Thinking," to measure the mathematics basic skill levels of secondary teacher education candidates is questionable. (3) Descriptive correlations computed for sex, class, curricular major, high school class rank, college grade-point average, *Scholastic Aptitude Test* Mathematics, Verbal and Total scores of the *ETS Tests of General Education* indicate that use of these measures for predicting the basic skill levels of secondary teacher education candidates is questionable.

### A NATURALISTIC STUDY OF INTERMEDIATE AND JUNIOR HIGH LEVEL MATHEMATICS CLASSROOMS FOR THE DEAF, WITH EMPHASIS ON TIME-ON-TASK

**Order No. DA8228978**

**DANIELE, VINCENT ANTHONY, PH.D.** *Syracuse University*, 1982. 224pp.

The purpose of this study was to discover whether there are correlations between deaf students' rates of academic engagement and their levels of mathematics achievement; and to describe observed classrooms, with an emphasis on selected variables relating to instructional setting and type of activity, and to determine which of these variables appear to maximize students' time-on-task. Additionally, the correlations and descriptive passages generated were compared with general trends established by previous research with normal-hearing populations.

An observational tool was used by the author to record instructional settings, general activities, specific activities, and student attentiveness in 12 mathematics classes in schools for the deaf (N = 76 students). Results of the Special Edition of the Stanford Achievement Test for Hearing Impaired Students (SAT-HI) were used to determine levels of student achievement in the areas of mathematics computation and mathematics concepts.

Results of the study indicate that: (1) There are strong positive correlations between student attentiveness and achievement in the areas of math computation and math concepts. The correlation for computation was higher than the one for concepts. When student rates of academic engagement were adjusted for time during which students were off-task due to circumstances beyond their control, the correlation between attentiveness and computation became even stronger. (2) Independent student seatwork with paper and pencil practice exercises was the most common instructional strategy employed by the teachers in the study. Whole class discussion was also used extensively. Large amounts of time were taken in unrelated work, transition, interruption and student waiting. The number of computational activities provided to students far outweighed the conceptual and mathematics application exercises given to them. (3) Students exhibited higher rates of academic engagement in group settings than in independent work environments. Likewise, they had higher rates of academic engagement when the nature of the activity included discussion or the use of computers or other educational materials than they did when the task involved writing. (4) In the main the findings tend to be very close to those chronicled in previous research with normal-hearing populations.

Results were interpreted as lending support to the notion that time-on-task, when coupled with quality instruction, can be a powerful variable in the mathematics programs of deaf students.

## A STUDY OF RELATIONSHIPS BETWEEN ENVIRONMENTS AND STUDENT ACHIEVEMENT

**Danley, Raymond Roger**, Ph.D. *University of Toronto (Canada)*, 1982.

This study examines the interactive relationship of two environmental settings--the home and the classroom--and four measures of student growth--Reading, Mathematics: Concepts, Mathematics: Problem Solving, and Self-esteem. The potential strength or potency of the influence from each setting was also examined for the four outcome measures. Each setting was measured along three dimensions of influence--attitudinal, process, and structural. A three-stage multivariate regression analysis was used to examine the data from 1,660 Grade 5 students in 144 classrooms in southern Ontario.

The interaction of the home and classroom environments was found to have a significant relationship with scores in Mathematics: Concepts. No significant relationship was found between the interaction of the two environmental settings and scores in Reading, Mathematics: Problem Solving, and Self-esteem. The strongest relationship with all four outcome measures was with past achievement.

The strongest relationship that all four outcome measures had with a home environmental variable was with the structural dimension of the home environment, as measured by an index of the socio-economic status (SES). The home environment had a significantly stronger relationship with scores in Reading than did the classroom environment. For Mathematics and Self-esteem the strength of the relationship with environmental variables was equal for both the home and the classroom.

The dimensions of the classroom environment were conceptualized within the constructs of "open education". The dimension of "open education" was found to have negative correlations with all three cognitive outcome measures--Reading, Mathematics: Concepts, and Mathematics: Problem Solving and to have a positive correlation with the affective outcome measure--Self-esteem.

## A COMPARISON OF TWO APPROACHES IN TEACHING MATH WORD STORY PROBLEM SOLVING TO SKILL DEFICIENT FOURTH GRADERS

Order No. DA8301767

**Darch, Craig Bernard**, Ph.D. *University of Oregon*, 1982. 130pp. Adviser: Douglas Carnine

This study compared a Direct Instruction method of teaching multiplication and division story problems to skill deficient fourth graders with a traditional approach. With the Direct Instruction method, teachers explicitly modeled step-by-step strategies for solving problem types. The traditional approach was based on the methods used in four state-adopted mathematics programs. Though teachers demonstrated how to solve problems, step-by-step strategies were not modeled. The major consideration was to ensure high interest and motivation by attempting to relate examples to students' everyday experience.

Seventy-three low performing fourth graders were randomly assigned to one of four groups. Daily instruction lasted 35 minutes. Subjects were taught in small groups (of two to four). The four experimental groups were: (1) DI with fixed amount of practice, (2) traditional instruction with fixed amount of practice, (3) DI with extended practice, and (4) traditional with extended practice.

The two groups taught with fixed number of practice problems received 120 multiplication and division problems, while the extended practice groups received up to eight additional lessons in their instructional program.

A 26 item test of word problems was administered immediately after treatment. A parallel form maintenance test was administered 10 days later.

Data were analyzed by a 2 x 2 x 2 ANCOVA with repeated measures. The between-subject factors were (a) Type of Instruction and (b) Provision of extended Practice. The within-subject factor was (c) Time of Test (Post vs. Maintenance). The covariate were the scores on a screening test of problem solving.

The results indicated a significant three way interaction. Therefore, separate 2 x 2 analyses of simple main effects were performed on the post and maintenance tests. Post test result revealed that both DI groups performed significantly higher than the traditional groups. There was no effect for provision of extended practice.

On the Maintenance test, a significant interaction was found between Type of Instruction and Provision of Extended Practice.

Provision of additional practice tended to enhance performance on the maintenance test somewhat for children taught with DI. Surprisingly, it did not improve performance of students taught with traditional methods on either the posttest test or maintenance.

## A STUDY OF HIGH SCHOOL CONTENT AREA TEACHER JUDGMENTS OF SOUNDNESS AND FREQUENCY OF USE FOR TEN VOCABULARY DEVELOPMENT PRACTICES

Order No. DA8302846

**Darnell, Robert Sheldon**, Ed.D. *University of Illinois at Urbana-Champaign*, 1982. 182pp.

Primary purposes of this study were (1) to identify vocabulary practices which content area teachers report are most sound for instructional use; (2) to identify vocabulary practices high school content area teachers report they use most frequently for vocabulary development; (3) to determine how length of teaching experience, content area, ability level taught, and participation in coursework emphasizing reading methods relate to teacher judgments in respect to (a) soundness and (b) frequency of use of ten vocabulary practices.

To secure teacher responses in respect to the purposes above, a survey questionnaire including ten commonly recommended vocabulary development practices was designed and sent to 365 English, math, science, and social studies teachers in a north-suburban Illinois high school district in May 1982.

Analysis of variance and analysis of covariance were used to compare response patterns and questionnaire data. (1) Teachers judged all vocabulary practices sound, but teachers reported the least confidence in the definition with original sentence practice and the dictionary or glossary vocabulary practice. (2) They also reported differences in the extent to which they used various vocabulary practices. The direct and vicarious experience practice and the use of context were reportedly used most often, whereas the wide reading, reinforcement and drill, and definition with original sentence vocabulary practices were reportedly used least often. (3) Although teacher judgments of soundness and the number of reading courses the teachers had completed were not related, teacher judgments of soundness were related to years of teaching experience content area taught, and ability level, for various vocabulary practices. Whereas reports of frequency of use were related to years of teaching experience in respect to only the multiple meanings practice, reports of frequency of use were related to the number of reading courses completed by teachers, content area taught, and ability level, for almost all of the vocabulary practices.

As a result of the findings, the investigator recommended more pre-service and in-service education in teaching reading. He also recommended making professional literature and student instructional materials available in the schools. Based on the findings from the present investigation, he also recommended further research to ascertain actual practice in the classroom.

### THE UTILITY OF WISC-R PATTERN ANALYSIS IN THE PREDICTION OF ACADEMIC ACHIEVEMENT FOR LEARNING DISABLED CHILDREN

**Order No. DA8323489**

DAVENPORT, MARTHA ANN REID, ED.D. *East Texas State University*, 1983. 213pp. Adviser: Jerry B. Hutton

*Purpose of the Study*. This study sought to contribute to the resolution of the controversy regarding the utility of WISC-R profile analysis for learning disabled children, by determining whether knowledge of a student's pattern of strengths and weaknesses on the WISC-R subtests would reduce predictive error for reading, mathematics and written language achievement beyond knowledge of the IQ scores alone.

*Procedure*. Subjects were 100 school identified learning disabled caucasian males, ages eight to thirteen years, of lower middle to upper socio-economic class. Their test data, including Wechsler Intelligence Scale for Children-Revised (WISC-R) and Woodcock-Johnson Psycho-Educational Battery Part Two: Tests of Achievement (W-J) scores, were obtained from various suburban and rural school districts in the Dallas-Fort Worth, Texas, Metroplex.

Dichotomous scores were employed to indicate the presence (+1) or absence (−1) of strengths or weaknesses in three different methods of determining the WISC-R profiles: each subtest in comparison with Verbal or Performance Scale means, each subtest in comparison with the child's overall mean, or each subtest in comparison with the test mean of ten points. Significant factors resulting from three separate cross products agreement matrices were rotated according to the varimax criterion. The factor loadings were then used, along with Verbal, Performance and Full Scale IQ scores, as the independent variables in three separate stepwise multiple regression analyses. Reading, mathematics and written language scores were regressed on the IQ scores and factor loadings to determine the usefulness of the patterns, represented by the factor loadings, in predicting reading, mathematics and written language achievement.

*Findings*. Results of the analyses indicated that only very small amounts of residualized variance in reading and mathematics were explained by the WISC-R patterns. However, knowledge of the patterns of strength and weakness did predict significant amounts of residualized variance in written language. An unexpected finding was that PIQ was most prominent in the combination of variables accounting for variance in achievement scores for this group of learning disabled children.

*Conclusions*. Results of this study indicate that use of a large sample of learning disabled students, close control of variables, and the use of pattern analysis increased predictive ability of the WISC-R profile for academic achievement of learning disabled children.

### A COMPARATIVE ANALYSIS OF ENRICHMENT PROGRAM PARTICIPATION AND ACADEMIC ACHIEVEMENT OF INTELLECTUALLY SUPERIOR STUDENTS

**Order No. DA8316179**

DAVIS, BEVERLY IRBY, ED.D. *The University of Mississippi*, 1983. 102pp. Director: Dr. Peggy Emerson

This study was conducted to (a) determine if the provision of special curricular experiences for gifted students resulted in significant differences in achievement among male and female students when compared on the basis of length of participation in a gifted program and when covariates for the California Achievement Test (CAT) pretest scores and Full Scale IQ were used; and (b) determine if a prediction equation could be formulated between the Wechsler Intelligence Scale for Children-Revised (WISC-R) subtest scores and reading and math achievement scores as measured by CAT.

The data used in this investigation were obtained from 79 fifth and sixth grade students (IQ's 120 or above) in seven northwest Mississippi school districts. The subjects of this study were rural gifted children divided into four groups: Group 1, gifted but non-participants; Group 2, 1 year enrichment program participants; Group 3, 2 year enrichment program participants; and Group 4, 3 year enrichment program participants.

Analysis of covariance was used to compare differences among the groups. Multiple regression analysis was used to test for a prediction equation between the WISC-R subtests and the CAT reading and math subtests.

Analyzation of the data led to the following conclusions: (1) Achievement scores in reading and math on the CAT are not significantly increased by the length of participation time in gifted enrichment programs. (2) Enrichment programs appear to contribute to increased achievement on the CAT math subtests for 1 year participants. (3) WISC-R subtest scores may not be useful in predicting CAT reading and math subtest scores.

The following recommendations based on the conclusions were made: (1) If the objective of enrichment programs is to assist in the increase of academic achievement, then a vertical rather than horizontal enrichment program is needed. (2) If placement in gifted programs is dependent upon WISC-R intelligence scores, then initial screening using the CAT should be used with caution.

### LOCUS OF CONTROL AS A PREDICTOR OF SCHOOL SUCCESS FOR PRIMARY-GRADE CHILDREN

**Order No. DA8313627**

DAVIS, MARY JEAN, ED.D. *The University of Florida*, 1982. 93pp. Chairman: Dr. Gordon Lawrence

The personality variable of locus of control as a predictor of school success for primary-grade children was assessed in this study. Regression analysis was used to test the significance of locus of control as a predictor of math and reading achievement scores as the dependent variables and intellectual ability, race, sex, socioeconomic status, and locus of control as the independent variables.

Locus of control was measured by the Bialer Locus of Control Scale and the Preschool-Primary Nowicki-Strickland Internal-External Scale. A teacher-rating scale, developed by the researcher, provided a score for each student on characteristics reflecting internality-externality in the classroom and was a third measure of locus of control. Reading and math achievement were measured by the Metropolitan Achievement Test.

The subjects were 212 second-grade students from three elementary schools with a total of 12 classrooms and teachers represented in the study.

Regression analysis revealed that intellectual ability and locus of control, as measured by the teacher rating, were both significant predictors of reading and math achievement at the .01 level. Race, sex, socioeconomic status, the Bialer Scale, and the Preschool-Primary Nowicki-Strickland Internal-External Scale were not significant predictors.

An interaction of race with the total locus of control scores (the sum of the Bialer Scale and the Preschool-Primary Nowicki-Strickland Internal-External Scale) in relation to reading achievement was found to be statistically significant at the .05 level, indicating locus of control was more positively related to reading for whites than blacks.

Adequate achievers were rated by the teacher as significantly higher than underachievers in internal locus of control characteristics. A correlation of .54 for math and .56 for reading with the teacher rating was obtained, both significant at the .01 level. The teacher-rating scale provided an expedient measurement of locus of control for predicting school achievement of primary-grade children.

## THE EFFECT OF PROJECT ADVENTURE ON SIXTH GRADER'S READING AND MATH SCORES, AND ITS RELATIONSHIP TO LOCUS OF CONTROL

Order No. DA8314858

DEERY, BRIAN EDWARD WOLFE, PH.D. *Boston College*, 1983. 121pp.
Director: Dr. John S. Dacey

The theoretical foundation of this study concerns affective objectives as they relate to educational objectives and their influence in the learning processes of reading and math. This study will ask three major questions: (1) Can participation in a ropes course significantly improve participant's scores in reading and math? (2) What is the relationship between performance in a ropes course and locus of control? and (3) What is the relationship between performance in a ropes course and "Peer Locus of Control"?

Experimental group students received a 10 week course in Project Adventure during which they participated in planned risk-taking activities. The control group was brought to the course only to participate in the initiation event, the Infinite Wall. The control group continued in the normal school curriculum; the experimental group attended Project Adventure in lieu of gym classes.

The sample for this investigation was drawn from the population of sixth grade students attending both public and parochial schools in the City of Peabody, Massachusetts. Students were measured, using the Project Adventure "Rating Scale" focusing on the variables of: Risk, Competence, Leadership, Cooperation and Self-Confidence, while encountering "The Infinite Wall" both before and after the Project Adventure course. Locus of control scores were obtained by administering the Nowicki-Strickland *Locus of Control Scale for Children*. Reading and mathematics scores were obtained from the *Intermediate Battery of the Metropolitan Achievement Tests*, routinely given in the Peabody school system. The "Peer Locus of Control" construct was obtained by using 8 related items form the *Locus of Control Inventory For Children*.

The conclusions of this study rest in the realm of recommendations for future research.

Project Adventure was an excellent example of an interdependent situation where students needed others to solve the problems confronting them. Future research should focus on this cooperative environment and examine the behaviors and strategies which may assist in the transference of affective skills to educational objectives when comparing cooperative and competitive environments.

## REANALYSES OF FACTOR-ANALYTIC STUDIES OF MATHEMATICAL ABILITIES

Order No. DA8314713

DEGUIRE, LINDA JEAN, ED.D. *University of Georgia*, 1983. 327pp.
Director: Jeremy Kilpatrick

The study attempted to clarify the structure of mathematical abilities. Forty-eight factor-analytic studies were selected and their results conceptually synthesized. The factors were compared in six families: General, Numerical, Reasoning, Spatial, Verbal, and Mathematical.

Eleven data sets were reanalyzed from: Barakat (1951), Campbell (1956), Kline (1959), Mitchell (1938), Very (1967), Weiss (1955), Werdelin (1958), and Wrigley (1958). In each reanalysis, principal factor analysis was followed by graphical rotation to oblique simple structure. Higher-order analyses followed the same procedure. The structure was orthogonalized by the Schmid-Leiman procedure. The results were compared to each other and to the original results. Percents of total variance accounted for by factors were used to examine the association of each family with mathematical abilities.

A partial hierarchical structure of mathematical abilities appeared across the original and reanalyzed results. Reasoning abilities were closely associated with mathematics achievement. Numerical and spatial abilities were associated with certain aspects of mathematics achievement. Verbal abilities were minimally associated with mathematics achievement. There was evidence for a kind of mathematical factor. Fluid- and crystallized-intelligence abilities were closely associated with mathematics achievement. Evidence for the automatization of responses was found that extended to certain algebraic skills and revealed sex differences. Some algebraic factors appeared to split according to the cognitive processes involved in the tasks. Factors in the Numerical and Spatial families accounted for about 7% and 5% of the variance in mathematical abilities as measured by the test batteries in the reanalyses. The percents of variance accounted for by the Reasoning, Verbal, or Mathematical families were less definite. Fluid- and crystallized-intelligence-like factors each accounted for about 9% of the variance. Higher-order factors together accounted for about 25% of the variance, as did first-order factors together. Collectively, the factors in the reanalyses accounted for about 50% of the variance, most of which represented the relationship of mathematical abilities to general cognitive abilities. The diversity among the studies that prevented a statistical synthesis of the results strengthened the generality of the finding concerning structure.

## THE RELATIONSHIP OF ATTITUDE, MATHEMATICS BACKGROUND AND JUNIOR COLLEGE TRANSFER STATUS IN ENTERING ELEMENTARY EDUCATION MAJORS TO COMPETENCY IN ELEMENTARY MATHEMATICS

Order No. DA8321481

DENNIS, ONEITA SUE SHIRAH, ED.D. *University of Southern Mississippi*, 1983. 90pp.

Entering elementary education majors at the University of Southern Mississippi (USM) participated in this study to determine the relationships among attitude toward mathematics, mathematics background, and transfer versus non-transfer status upon competency in elementary mathematics. Seventy-seven subjects participated.

Instruments for collecting data included the Mathematics Placement Test developed by USM, the *Mathematics Attitude Scale* by Aiken, and a questionnaire designed to gather information on mathematics background and junior college transfer status.

Multiple linear regression was used to test the hypotheses. Competency in elementary mathematics was the criterion variable in all analyses. The .05 level of significance was used. An iteration sequence for each model was detailed and discontinued when less than one percent variance was added to the equation by the predictor.

Comparisons of the means showed that the stronger the background in mathematics, the higher the competency score. Significant relationships were found to exist in three of the hypotheses: (1) A significant relationship existed between the composite set of predictor variables and mathematics competency (p. $<$ .01). (2) A significant relationship existed between attitude toward mathematics and mathematics competency (p. $<$ .01). (3) A significant relationship existed between mathematics background and mathematics competency (p. $<$ .05). No significance was found to exist between junior college transfer status and mathematics competency (p. $>$ .05).

## PREDICTING ACHIEVEMENT IN COMMUNITY COLLEGE SCIENCE STUDENTS

Order No. DA8304478

DETTLOFF, JANET MAY, PH.D. *The University of Michigan*, 1982. 225pp.
Chairman: Burton E. Voss

This research study was designed to formulate a predictive equation which could be utilized to identify those students who most probably would not succeed in science education. Data were collected from 420 students enrolled in the General Biology Course at a largely urban mid-western community college which serves a heterogeneous population. The data included background characteristics, reading ability, math ability and cognitive development level. The instruments used to collect these data were: (1) College Biology Student Survey, (2) The Nelson Denny Reading Test, Form F, (3) The CGP Applied Arithmetic Test, and (4) An Inventory of Piaget's Developmental Tasks.

The data showed that the General Biology classes had a higher percentage of females (82%) than males (18%). The students' median age was 26. The classes were racially balanced (49% white, 51% non-white). The majority of the students (71%) were single or formerly married. The students' average math score was 15 correct answers out of 25 choices on a math test approximately sixth grade level. The students' average reading ability was the twelfth grade level. Only 9% of the students were at the formal level of cognitive development. The average grade was 2.7 (C+).

Multiple regression was used for the analyses. Background characteristics, reading and math ability accounted for 42% of the variance in the students' cognitive development and 43% of the variance in the students' achievement. Cognitive development accounted for 12.8% of the variance in the students' achievement. With cognitive development as a mediating variable, the background characteristics, reading and math ability accounted for 22% of the variance in the students' achievement. The predictive equation formulated was: $Y' = 0.42 + 0.14$ cognitive development $+ 0.18$ reading ability $+ 0.13$ math ability $+ 0.04$ race $+ 0.04$ mothers' occupation $+ 0.07$ fathers' education $+ -0.11$ number of siblings $+ -0.06$ marital status.

Recommendations were made about the improvement of these students in the basic skills area.

## THE EFFECTS OF DATA-BASED INSTRUCTION ON THE LEARNER'S ACQUISITION OF THE BASIC ADDITION AND SUBTRACTION FACTS

Order No. DA8229213

**Dews, Janet Lee**, Ed.D. *Northern Illinois University*, 1982. 153pp.

This study investigated the effect data-based instruction had on the acquisition of the basic addition and subtraction facts of second graders.

Data-based instruction is a system of instruction which provides for individualization and has the added elements of daily drill and reinforcement. This system of reinforcement is also a system of accountability since it documents in graphic format the performance of each individual's daily progress. This graphic representation is an important component of data-based instruction since it provides informational feedback to each individual as to his progress.

Student subjects came from four elementary school districts located in the western suburbs of Chicago. Two second grade classes in each participating district were randomly assigned to either the experimental or control group.

Each student was given a pre-test on the one hundred basic addition facts, and the one hundred basic subtraction facts. Each pre-test was four minutes in duration.

The experimental method, data-based instruction, was employed for six weeks with the experimental class. During this time, each learner in the experimental class was given instruction at his current functioning level on the basic addition and subtraction facts. In addition to working at his individualized level, each learner received daily a graphic representation of his performance which provided him with feedback as to his progress.

Following the six weeks of the study, each student was given a post-test on the one hundred basic addition facts and the one hundred basic subtraction facts. Each post-test was four minutes in duration.

Findings of the study were based on comparisons of the experimental and control groups' scores on the pre- and post-tests. Analysis of variance and analysis of covariance were the statistics used to lead to the following findings. (1) Students taught by teachers utilizing data-based instruction scored higher on the post-test on the number of addition and subtraction facts answered correctly than students taught by teachers who utilized traditional instruction. (2) Method of instruction did not make a difference in the number of basic addition or subtraction facts answered incorrectly for second grade children.

## A STUDY COMPARING ADVANCED PLACEMENT AND FIRST-YEAR COLLEGE CALCULUS STUDENTS ON A CALCULUS ACHIEVEMENT TEST

Order No. DA8311328

**Dickey, Edwin Milton, Jr.**, Ph.D. *University of South Carolina*, 1982. 173pp. Chairman: Professor Jack M. Ott

This study compared random samples of Advanced Placement (A.P.) Calculus BC students to first-year college calculus students on a calculus achievement test. The objective of the study was to decide if the placement problems involving A.P. students which had been described in the literature were based on poor A.P. student achievement or erroneous college placement policies.

The testing instrument used in the study was constructed by analyzing college and A.P. examinations to derive subject areas common to both levels of instruction. This produced a non-differentially valid instrument. The instrument's validity was derived from the construction procedures and its reliability was computed to be 0.81.

The samples of A.P. and college students tested were drawn from four regional subpopulations. Conclusions were made concerning each region and the entire nation. A total of 247 A.P. Calculus BC students at fifteen high schools were tested as were 229 first-year college calculus students at nine institutions drawn from the 200 enrolling the largest number of A.P. candidates.

The national mean of 56.1% for the A.P. Calculus BC students was significantly higher than the 47.9% mean for the first-year college calculus students. In the Southeast, Central, and West regions A.P. students scored significantly higher than their college counterparts. In the Northeast region, the A.P. group scored higher but this was not significant.

The primary conclusion of the study was that A.P. Calculus BC students achieve as well as or better than first-year college calculus students. A secondary conclusion was that large numbers (45%) of A.P. Calculus students do not take the A.P. Calculus BC Examination.

*Recommendations*. (1) Colleges should consider liberalizing placement policies concerning A.P. Calculus BC students. (2) High schools should insure that A.P. students continue to be properly prepared and that they carry through their commitment to advanced placement by taking the A.P. Examination. (3) The Educational Testing Service should make efforts to avoid misinterpretation of the reported A.P. Examination scores on the part of college placement officials by considering a new three point system of reporting scores: Recommended for Credit, Recommended for Credit with Reservations, and Not Recommended for Credit.

## COGNITIVE STYLE AND THE IDENTIFICATION OF EDUCATIONALLY "AT RISK" KINDERGARTEN CHILDREN

Order No. DA8321709

**DiFabio, David Michael**, Ed.D. *The University of Rochester*, 1983. 93pp.

The purpose of this study was to investigate the relationship of educational risk of kindergarten children to performance on standardized assessment instruments of cognitive style and classroom performance levels in reading and mathematics. In addition, the determination of whether a relationship existed between sex and cognitive style and between SES and educational risk was made.

One hundred and nine children ranging in age from 5 years 5 months to 6 years 6 months comprised the population. Children were classified as "at risk" (AR) or "not at risk" (NAR) based upon a prescreening test battery and teachers' observational ratings. Children of each category received the Children's Embedded Figures Test as the cognitive style measure of field dependence-independence. In addition, the Test of Early Reading Ability and the Key Math Diagnostic Arithmetic Test were employed to determine classroom academic performance levels.

Based upon the CEFT, 81% ($n = 35$) of the AR group was field dependent (FD) while 19% ($n = 8$) were field independent (FI). In contrast, 45% ($n = 30$) of the NAR group was FD while 55% ($n = 36$) were FI. A Biserial r correlation coefficient of .51 was obtained for the variables of educational risk and cognitive style. Classroom performance levels in reading and mathematics of AR/FD children were lower than NAR/FI children. Point Biserial r ($pbr_1$) correlation coefficients of .65 and .66 were obtained between cognitive style and reading performance and cognitive style and mathematics performance respectively.

According to the findings, there was no relationship between the variables of sex and cognitive style for AR/FD males and females ($pbr_1 = .02$). An examination of the relationship between SES and classification of educational risk revealed the existence of a weak relationship between the variables ($pbr_1 = .35$).

From the results of this study it is evident that field dependence is characteristic of children classified as educationally "at risk" while field independence is not necessarily the cognitive style of "not at risk" children. In addition, "at risk"/field dependent children have lower performance scores in the areas of reading and mathematics than their "not at risk"/field independent peers.

### AN EXPLORATION OF THE RELATIONSHIP BETWEEN INFERENCING ABILITY AND SCHOOL ACHIEVEMENT IN FOURTH AND SIXTH GRADE CHILDREN

Order No. DA8322975

DOLL, ELIZABETH JANE, PH.D. *University of Kentucky*, 1983. 125pp. Director: Dr. James R. Barclay

This study investigated individual differences in children's inferencing ability and the relationship of these differences to a measure of school achievement. Fifty children in the fourth and sixth grades served as subjects. An inference task was developed to allow experimental control of memory, verbal ability and the amount of premise information available for the inference. The inference variables were two measures of the certainty attached to inferences (reported certainty and frequency of inference change) and two measures of the understanding of inferences (accuracy of justifications of children's own inferences and of inferences attributed to another child). Standard scores from a recent administration of the Comprehensive Tests of Basic Skills (Reading and Mathematics subtests) were used as a measure of achievement.

It was concluded that individual differences do exist in children's recognition that inferences are probabilistic and in their ability to explain their own inferences and those of other children. These differences are related to the achievement measure, with high achieving children attaching less certainty to their inferences and more able to explain inferences opposite to their own. The certainty variables and explanation variables were uncorrelated.

### POWER AND CURRICULUM IMPLEMENTATION: A CASE STUDY OF AN INNOVATORY MATHEMATICS PROGRAM

Order No. DA8317021

DONOVAN, BRIAN FRANCIS, PH.D. *The University of Wisconsin - Madison*, 1983. 331pp. Supervisor: Professor Thomas A. Romberg

The purpose of the study was to describe and explain the implementation of an innovatory measurement program in terms of power. Curriculum implementation was seen as a process in pedagogical, occupational, and social-cultural contexts in which social groups with unequal power, and in contradictory ways, contested control.

The site for the study was an inner suburban Melbourne elementary school which was classified by the Australian Schools Commission as disadvantaged. Students were from diverse ethnic and social class background.

An ethnographic approach was employed with knowledge and work as orienting constructs. Data, in the form of observations and interviews, was gathered from the principal, six classroom teachers covering all grade levels and a teacher-aide who coordinated the program. Observations were made over a six month period. Interviews were conducted with parents of five children. These comprised Australian and Greek parents, working-class and middle-class parents, a single-parent and members of the School Council. Other interviews were held with the designer of the program, a mathematics educator who introduced the program to the school, a member of the School Review Board, the Community Education Officer and Area Supervisor for funding under a Disadvantaged Schools Program. Relevant documents made available by the school were also used in the analysis.

During the study 'Beyond academic achievement' emerged as a theme underlining the knowledge being distributed by the school. The meanings of achievement were, however, contested and contained contradictions in practice. Six subthemes were analyzed. The first pointed to the controlling influence of middle-class ideology. A second was curriculum and organizational fragmentation. The third analyzed how the school muted academic competition to the advantage of middle-class students. The fourth and fifth subthemes explored instructional processes which contributed to, and masked, an unequal distribution of knowledge. In the sixth, forms of control, resistance, and compliance were analyzed.

Conclusions were made on classroom relations, social class differences between lower and upper school grades, the contestation within the occupational community over appropriate knowledge, parent participation, measurement as knowing and doing mathematics and power and curriculum development. Limitations to the study are discussed and suggestions made for further study.

### A CLINICAL INVESTIGATION ON THE EFFECTS OF PERMUTATIONS OF PROBLEM TYPES AND TIME ON THE SOLUTION STRATEGIES OF FIRST GRADE CHILDREN ON ADDITION AND SUBTRACTION WORD PROBLEMS

Order No. DA8316525

DUDLEY, ALAN GEOFFREY, PH.D. *University of South Florida*, 1983. 178pp. Major Professor: A. Edward Uprichard

In previous research ten distinct problem types for addition and subtraction verbal problems and first-grade children's solution strategies to these problems have been identified. These strategies and problems form the foundations of this study.

Clinical methodologies were used to examine the interaction effect of mathematical operation (addition and subtraction), data presentation (permutation of data) and cognitive abilities (IQ and time) on the problem solving process. Descriptive statistical techniques were used to detect: (a) patterns of solution strategies that may exist over various problem types; (b) trends in solution strategies across permutations of the same problem types; and (c) patterns in solution strategies across levels of intellectual functioning; and (d) patterns in solution strategies over time.

Eighteen grade one children in Bendigo, Victoria, Australia were partitioned into three ability groups and administered all six data permutations of the ten problem types. The numbers used in the study had a sum within the inclusive range of 11 to 16. These numbers also were less than ten and had an absolute difference of at least two. Six months later, the sixteen remaining subjects were tested on the same set of problems.

While the sample size is small, results of the study appear to indicate a possible hierarchy of addition strategies: (a) being unable to understand the problem; (b) counting all; (c) random counting on; (d) counting on from the larger number; (e) automatic response. No hierarchy appeared for subtraction problems with the strategies of separating, adding on and matching being used interchangeably across the testing periods.

Differences in solution strategies were not apparent for permutations of the addition problem types. Problem permutations for the subtraction problems in which the total followed the subtrahend in the data presentation initially appeared to be difficult for the average and below average group. At the second testing period, only the below average group still experienced difficulty. It is hypothesized that such permutations do not allow a direct mapping of the sequence of the linguistic structure with the mathematical process, but this reliance on direct mapping disappears with time or experience.

Hypotheses are generated for future research studies.

### A STUDY OF THE RELATIONSHIPS AMONG COMPUTER PROGRAMMING ABILITY, COMPUTER PROGRAM CONTENT, COMPUTER PROGRAMMING STYLE, AND MATHEMATICAL ACHIEVEMENT IN A COLLEGE LEVEL *BASIC* PROGRAMMING COURSE

Order No. DA8311672

DUGGAR, CYNTHIA MILLER, PH.D. *Georgia State University - College of Education*, 1983. 145pp.

*Purpose.* The purpose of this study was to investigate the role of several variables upon computer programming ability and computer programming style. The goals of the study were: (1) Is computer programming ability related to computer program content with respect to algebraic versus geometric programming problems? (2) Is computer programming ability related to computer program content with respect to pure versus applied programming problems? (3) Is computer programming ability related to mathematical achievement by content? (4) Is computer programming ability related to computer programming style? (5) Is computer programming style related to computer program content? (6) Is computer programming style related to mathematical achievement?

*Methods and Procedures.* Nine students from an introductory BASIC programming class at a public, two-year community college participated in the study. Students were given a mathematical achievement test (divided by content) and a computer literacy test prior to instruction. All students were given instructions in the following programming styles: flowchart, algorithms, mathematical, and encoding. Each student then wrote 12 programs, three each in the following content areas: pure algebraic, applied algebraic, pure geometric, and applied geometric.

Three statistical and three descriptive hypotheses were tested. The statistical hypotheses were related to theories either directly or indirectly proposed in the review of the literature (Goals 1-3). A two-way randomized block design with a priori orthogonal comparisons was used to evaluate Goals 1 and 2. Simultaneous confidence intervals constructed by the Bonferroni technique were used to address Goal 3.

Since Hypotheses 4-6 (Goals 4-6) had not been addressed in the literature, a descriptive method of analysis was used.

*Results.* Results indicate significant differences in programming ability of algebraic versus geometric computer program content. However, no differences in programming ability were evident between pure and applied computer program content. Only algebraic mathematical ability was found to have a positive effect upon programming ability. Programming ability was not found to be related to geometric mathematical achievement. The algorithmic style was found to be associated with both high programming ability and high mathematical achievement. No statistically significant correlation was found between program content and programming style.

### THE EFFECTS OF READABILITY OF MATHEMATICAL MATERIALS ON ACHIEVEMENT IN AN EIGHTH GRADE MATHEMATICS CLASS

Order No. DA8312275

**Durham, Anna Mae Hawthorn**, Ed.D. *Texas Woman's University*, 1982. 159pp. Supervisor: Howard L. Stone

The effects of the readability level of mathematics materials on achievement for regular eighth grade students was experimentally studied. Readability levels were determined by the application of R. B. Kane's Formula II for readability of mathematics materials.

The subjects were 55 students enrolled in three regular eighth grade mathematics classes in an inner-city middle school. Students were assigned to a regular class based on their Iowa Test of Basic Skills mathematics score.

One mathematics lesson was written at three different levels of readability by manipulating the variables presented in Kane's Formula II. Each class was randomly divided into three groups, each group then being assigned a different level of readability. The students were administered a pretest and a posttest over the material presented in the lessons.

Two basic analyses were made of the data: first, a comparison of the range of pretest scores and the posttest scores; second, analysis of variance of the pretest scores, posttest scores and the difference between the pretest scores and posttest scores. For this analysis, arrangements were made to use the VRE library program in the inner-city school district computer center.

Utilizing statistical analysis, the author concluded that the readability level of mathematics materials has a significant effect on the achievement in mathematics. The group that received the materials written at the losest readability (least difficult) level scored significantly higher on the posttest than did the other two groups.

### THE EFFECTS OF COMPUTER ASSISTED INSTRUCTION AS A SUPPLEMENT TO CLASSROOM INSTRUCTION IN READING COMPREHENSION AND ARITHMETIC

Order No. DA8228032

**Easterling, Barbara Ann**, Ph.D. *North Texas State University*, 1982. 54pp.

The present research was an investigation of the effects of computer assisted instruction as a supplement to classroom instruction in reading and arithmetic.

The purposes of this study were to determine the effectiveness of microcomputer usage in supplemental reading comprehension and math instruction.

Utilizing an elaboration of the pre-test, posttest control group design, 66 fifth graders completed the 4-month study. One-way analysis of covariance was used to analyze the data.

The findings include the following. (1) Scores for Reading Comprehension on the *California Achievement Test*, Level 15, Form C, of the reading experimental group did not differ significantly from scores for Reading Comprehension of the reading control and the control group. (2) Scores for Total Math on the *California Achievement Test*, Level 15, Form C of the math experimental group did not differ significantly from scores for Total Math for the math control and the control group.

The following conclusions were drawn. (1) Using the *SRA Computer Drill and Instruction: Mathematics* courseware and the *MicroSystem80 Critical Reading Series* courseware two fifteen minute sessions weekly for sixteen weeks does not significantly improve the Total Math or Reading Comprehension on the *California Achievement Test*.

The following recommendations were made. (1) It is recommended that a study be conducted using a larger sample and allowing students more computer time. (2) Further research in the area of CAI as a supplement to classroom instruction is justified. (3) It is recommended that courseware be validated before it is brought into a district for classroom use. (4) It is recommended that other studies include affective measures to gather qualitative data concerning student attitudes toward the computer. (5) It is recommended that other studies include measures of computer literacy to gather quantitative data concerning student knowledge of the computer.

### INDIVIDUALIZED INSTRUCTION IN MATH AND ITS EFFECT ON MALES AND FEMALES WITH ACADEMIC DISABILITIES

Order No. DA8312528

**Edelman, Uri**, Ph.D. *University of Pittsburgh*, 1982. 151pp.

The purpose of this study was to investigate if individualized instruction affects male and female students differently.

One hundred sixty subjects were researched during one academic term.

Fourteen hypotheses were studied in the following areas: math achievement, self-concept, attitudes and control over the learning environment.

Results showed a significantly higher improvement of the experimental students in all the investigated areas. A significant difference between males and females was found in math achievement only. This difference, however, appeared in the control group, while in the experimental group, math achievement of both genders was close to each other.

No significant difference between males and females was found in measurements of self-concept, attitudes and control over the learning environment. Nevertheless, there were wider differences between the sexes in the control group than in the experimental group, where females' scores in these areas were close to those of their male counterparts.

The individualized treatment had an overall effect that improved students' achievement and reduced traditional math differences between males and females.

### EFFECTS OF THE USE OF CALCULATORS ON MATHEMATICS ACHIEVEMENT OF FIRST GRADE STUDENTS

Order No. DA8228649

**Edens, Helen Smith**, Ed.D. *University of Virginia*, 1981. 111pp. Major Adviser: William H. Seawell

The primary purpose of this study was to investigate the effects of using hand calculators on mathematics achievement at the first grade level. A second purpose was to determine the effects of inservice education for teachers on student achievement and teacher attitudes.

One control group and two calculator groups were randomly identified for the study. A total of 142 students participated. Teachers in one calculator group were given inservice education prior to the study.

Teachers maintained a record of their observations of the daily activities. Calculator and non-calculator groups used the same work sheets for thirty minutes each day during the six-week study.

One- and two-way analysis of variance and covariance techniques were used to determine significant differences at the .05 level in achievement for the calculator and non-calculator groups. Teachers' observations of student reactions were tabulated. Each of the eight mathematics objectives was rated by the teachers with regard to the usefulness of the calculator as an instructional aid.

The non-calculator group scored higher (.05 level) on the post-test of mathematics objectives and on mathematical concepts than did the calculator group. There were no significant differences between the groups in computation or total mathematics.

Students whose teachers had received inservice education on the use of calculators scored significantly higher (.05 level) on concepts than did students whose teachers had not experienced the inservice education. No significant differences were found between the two groups on any measure other than concepts.

No significant interaction effects (.05 level) were found between calculator usage and IQ scores or between calculator usage and the sex of the students. Teacher attitudes were more positive toward the use of calculators after the six-week experiment than they were before the experiment.

Performance on seven of the eight mathematics objectives was improved more by the non-calculator group than it was by the calculator group. Students in first grade mastered the operation of the calculator, were enthusiastic about using calculators, and did not view them as a substitute for traditional methods for adding and subtracting whole numbers.

### METHODS OF VALIDATING LEARNING HIERARCHIES WITH APPLICATIONS TO MATHEMATICS LEARNING

Order No. DA8307148

EKSTRAND, JUDITH MCELWAIN, PH.D. *Stanford University*, 1983. 180pp.

Relationships between mathematics tests, as direct measures of students' learning, and a theoretical learning process reflecting unmeasurable cognitive processes are explored using path analysis and factor analysis procedures.

The test results are from the National Longitudinal Study of Mathematical Abilities (NLSMA, 1962-1967) for grades 5 (N = 1776), 8 (N = 1130), 11 (N = 515), and 12 (N = 205). Test items were constructed following a cumulative hierarchical structure based on the first four categories in Bloom's Taxonomy of Educational Objectives for the Cognitive Domain--Computation (Knowledge), Comprehension, Applications, and Analysis. Data that correspond to this cumulative structure have a correlation matrix that exhibits a simplex structure.

The path analysis model assumes there should be direct links between mathematics scales from adjacent cognitive levels and no direct links from non-adjacent levels. Here, the mathematics test scores represent the underlying cognitive levels. Only the Grade 5 sample even weakly supports Bloom's hierarchy. Large error terms and multiple indicators for each cognitive level preclude strong interpretations.

Factor analysis uncovers the theoretical latent structure that could have produced the observed correlation matrix of the mathematics scales. Here, the latent structure, in contrast to relationships between observed test scores, is manipulated. Both orthogonal and oblique rotations of the first four principal components and the first four factors in a maximum likelihood factor analysis are examined. None of the rotations yield the expected structure exactly. However, the model for Grade 8 is very close to this structure. Grades 5, 8, and 12 support a two-factor model (say, computation and problem-solving).

In another factor analytic approach, the computer program LISREL IV integrates linear structural equation models involving observed test scores with latent variables corresponding to the four cognitive levels. Two models are specified and tested for their goodness of fit using a chi-square statistic. The first model specifies the test classifications according to cognitive level but does not limit the relationships between cognitive levels to Bloom's hierarchy. The second model differs only in specifying this cumulative hierarchy. In all grade levels, a large decrease in the chi-square statistic compared to a small change in the degrees of freedom provides supportive evidence that Bloom's hierarchical structure does exist in the data.

### AN INVESTIGATION OF THE RELATIONSHIP OF READING COMPREHENSION, VOCABULARY, MATHEMATICAL CONCEPTS, AND COMPUTATION ON PROBLEM SOLVING AMONG ANGLO, BLACK, AND CHICANO MALE AND FEMALE MIDDLE SCHOOL ADOLESCENTS

Order No. DA8229065

EXEZIDIS, ROXANE HARRES DADINIS, ED.D. *University of Houston*, 1982. 153pp.

*Purpose*. The purpose of this study was to determine the contribution of specific variables related to problem solving achievement. These variables were identified through a review of literature as being reading ability, vocabulary, mathematical concepts, computation, sex, and race.

*Procedures*. The subjects consisted of urban sixth, seventh, and eighth grade Anglo, Black, and Chicano male and female adolescents of above average ability. The 1978 edition of the *Iowa Tests of Basic Skills* was utilized in order to obtain data on the designated variables.

*Research Question*. The specific research question for this study was: To what extent is problem solving achievement in mathematics related to the six independent variables of reading, vocabulary, mathematical concepts, computation, sex, and race among students in grades 6, 7, and 8.

*Data Analysis*. Multiple regression analysis was used to analyze the data, along with an F test of statistical significance. A post hoc probe utilizing discriminant analysis was conducted to determine if (a) males and females and (b) Anglos, Blacks, and Chicanos are distinguishable in terms of the variables.

*Major Findings*. The findings of this study as related to students such as those considered are: (1) Achievement in problem solving in mathematics is highly correlated to an understanding of basic mathematical concepts. (2) Achievement in problem solving in mathematics is somewhat correlated to race-related differences. (3) Achievement in problem solving in mathematics is also weakly correlated to skills in computation, skills in vocabulary, sex-related differences, and reading ability. (4) There is no statistically significant interaction between the categorical variables (sex, race) and the predictor variables (reading, vocabulary, concepts, computation); the predictors seem to behave the same across all groups. (5) Prediction of group membership by race across the variables (problem solving, reading, vocabulary, concepts, computation) is better than chance for Anglos, slightly better than chance for Blacks, and no better than chance for Chicanos; vocabulary and problem solving differentiated among the races most. (6) Prediction of group membership by sex across the variables (problem solving, reading, vocabulary, concepts, computation) is not much better than chance; computation and vocabulary differentiated among males and females most.

### THE RELATIONSHIPS BETWEEN PIAGETIAN COGNITIVE DEVELOPMENTAL STAGES OF CONCRETE AND FORMAL OPERATIONS AND ACHIEVEMENT ON MATHEMATICAL RATIO AND PROPORTION PROBLEMS

Order No. DA8307905

FAJEMIDAGBA, OLUBUSUYI M., ED.D. *State University of New York at Albany*, 1983. 219pp.

Typically, subject matter as interpreted by professional mathematicians has been the major factor used to sequence secondary school mathematics curriculum items. The relationship between this kind of sequence and the cognitive capabilities of students has often been overlooked.

Thus, the purpose of this study was to confirm and illustrate a relationship between Piagetian cognitive development at the concrete and formal operational stages and achievement on the mathematical topics of ratio and proportion. This was achieved through (i) the derivation of a logical hierarchy among ratio and proportion test items and (ii) an empirical sequencing of items of the same ratio and proportion problems into [illegible] hierarchy of levels of difficulty.

A sample of 200 Form [illegible] students randomly selected from nine schools in Oyo state, Nigeria, and whose mean age was 14.1 years participated in the study. An investigator-constructed Mathematical Test of ratio and proportion was administered to the sample. Ninety-nine of the subjects were also also administered the Longeot Test and the Test of Logical Thinking (TOLT) in order to diagnose their levels of cognitive development. The TOLT was used to confirm the classification of formal operational on the Longeot Test.

McNemar's non-parametric statistical analysis was used to sequence the Mathematical Test items into a hierarchy of levels of difficulty and Noelting's (1980) model was used to derive a logical hierarchy among the Mathematical Test items. A stepwise regression analysis procedure was applied to determine the existence of significant multiple correlations between Longeot's measures of cognitive development and achievement on the Mathematical Test.

The results of the study showed that clusters of proportion and ratio items could be sequenced in order of difficulty and that sequence matched with the stages of cognitive functioning of students. More importantly, the empirical hierarchy of levels of difficulty was shown to have a one-to-one correspondence with the hierarchy established by logical analysis. Propositional thinking as on the Longeot subtest II was the best single predictor of achievement on the Mathematical Test of ratio and proportion while probability reasoning formed the second best single predictor of achievement on the same test. Finally, results on both the Longeot subtests and the Mathematical Test items suggested that the acquisition of ratio and proportion progresses in stages that are congruent to the Piagetian levels of operational development.

## THE EFFECT OF ROBINSON V. CAHILL ON FIFTH GRADE READING AND MATHEMATICS ACHIEVEMENT IN SELECTED NEW JERSEY SUBURBAN (RURAL) SCHOOL DISTRICTS

**Order No. DA8319234**

FAUST, ACE THOMAS, ED.D. *Northern Arizona University*, 1983. 140pp. Adviser: F. Mike Miles

Robinson v. Cahill challenged the legality of New Jersey's system of financing education; the New Jersey Supreme Court found educational funding to be unconstitutional. In response to the court decision, the Legislature passed the Public School Education Act of 1975, popularly dubbed the Thorough and Efficient or "T & E" Law. The act was designed to reform the educational finance system supporting public schools and improve educational programs. With much attention focused on the financial aspects of the law, and then on the regulations for implementation, few people have paused to ask the most important question: Has there been a significant improvement in student achievement as a result of the "T & E" law?

The purpose of this study was to gather and analyze data that might be useful in examining whether "T & E" has affected student achievement. This question was explored through an analysis of fifth grade reading and mathematics achievement test scores of selected suburban (rural) schools over a ten year period from 1973 to 1982. Reading and mathematics achievement was measured using the total reading comprehension scores and the total mathematical computation scores on the Iowa Tests of Basic Skills.

This study was ex post facto in nature due to the fact that the passage of "T & E" has already occurred. A successive group time series design was employed in the study. The null hypothesis stated that there has been no significant difference in fifth grade reading and mathematics achievement scores in selected suburban (rural) schools between 1973 and 1982. This time frame allowed the study to look at student achievement trends prior to and following the passage of the "T & E" law.

The independent t-test used to analyze the data indicated a significant difference between the pre-"T & E" years group achievement and the post "T & E" years group achievement. The post "T & E" years group yielded significantly higher achievement scores in reading and mathematics. The alternative hypothesis has been supported by the data analysis. The alternative hypothesis stated that there has been an improvement in student achievement since the passage of the "T & E" law.

## COGNITIONS AND PERFORMANCE OF HIGH AND LOW MATH ANXIOUS COLLEGE MEN AND WOMEN

**Order No. DA8308305**

FEE-FULKERSON, KATHERINE CYNTHIA, PH.D. *The University of North Carolina at Chapel Hill*, 1982. 171pp. Supervisor: John P. Galassi

Much recent literature of mathematics performance has suggested that males perform better than females and that mathematics anxiety may be a factor affecting performance generally and the performance of females more than males. Literature and theory dealing with cognitions during problem solving have further suggested that cognitions affect performance and may also reflect gender-related and anxiety-related differences in performance. This study was conducted to explore the relationships among gender, anxiety, cognitions, and performance and used undergraduates at the University of North Carolina as subjects. These students were asked to think aloud while solving mathematics problems taken from the SAT; cognitions generated from this procedure were examined for gender- and anxiety-related differences using multivariate and univariate analysis of variance and were used in a regression equation to predict performance on the problems.

No anxiety-related differences were found in the 11 categories of cognitions individually (review of information, strategic plans, calculations, conclusions, facilitative attention control, self-facilitations, irrelevancies, self-inhibition, neutral statements, silence, unclassifiable statements) or in a linear combination of the 11 categories; furthermore, no anxiety-related differences were found in performance on the problems.

No overall gender-related differences were found in a linear combination of the 11 categories of cognition or in performance on the problems. However, exploratory univariate analyses found some differences in individual categories of cognitions. Males used more irrelevancies and neutral statements about math and fewer mathematical calculations than females.

The relationship between cognitions and performance was different from what had been expected. Self-facilitating and self-inhibiting statements did not account for a significant amount of variation on the problems on which they were generated; instead, they accounted for a significant amount of variation on a second set of problems on which they were not generated. On the other hand, seven other categories of cognitions (review of information, strategic plans, strategic calculations, conclusions, neutral statements, unclassifiable statements, and silence) together accounted for a significant amount of variation on the problem on which they were not generated as well as the combined set of problems.

Results of this study are discussed in terms of their implications for theory of cognitions, assessment of cognitions, and gender- and anxiety-related differences in performance on math problems.

## EXAMINING THE EFFECTS OF THREE METHODS OF STUDY SKILL GROUP INTERVENTION WITH MIDDLE SCHOOL UNDERACHIEVERS

**Order No. DA8229796**

FENIGSOHN, GEORGE IRA, ED.D. *The College of William and Mary in Virginia*, 1982. 123pp. Chairman: Kevin Geoffroy

The purpose of this study was to seek the answer to the following question: Using small group interaction, which of three types of strategies best influences positive academic achievement and academic attitudinal change in seventh and eighth grade low achievers?

Thirty-six students who had failed one or more academic subjects (English, Math, Social Studies or Science) were randomly placed in one of four groups of nine students each. The first group was based on the theory and techniques of Rational-Emotive Therapy. It attacked the "blame factor" so common to transescents and attempted to build a strong and positive attitude in the students.

Practical study skill instruction was an adjunct to the rational-emotive approach. The second group was that of Structural-Study Skills. This group concentrated on procedures and techniques in practical skill building areas such as organization, note and test taking, homework preparation and other such didactic procedures. The third group was that of Affective Education. Its premise was that by attending to the underlying dynamics associated with academic failure the student, through a cathartic group experience, is better able to cope with personal and social problems and thus becomes able to deal with academic ones. Little emphasis was placed on study skills as such but rather on the emotional needs of the student. The fourth group was a control group which received no treatment.

The groups each met nine times for a period of forty-five minutes per session. The activities included open discussion, film strip viewing, paper and pencil activities and didactic instruction in various study skill areas.

Dependent variables were obtained pre and post treatment for all subjects. These included grade point averages, results of the Survey of Study Habits and Attitude questionnaire and results of the Teacher Observation Tally.

From the data analysis, the following conclusions were drawn on within group means: (1) The RET group showed significant improvement in Study Habits, Study Attitudes, Study Orientation and Teacher Observation Tally scores. It did not show improvement in GPA. (2) The Structured-Study Skill group showed significant improvement in Study Habits, Study Orientation and Teacher Observation scores but not in GPA or Study Attitudes. (3) The Affective group showed improvement in Study Habits and Teacher Observation Tally but not GPA, Study Attitudes or Study Orientation. The Control group showed improvement only in the Teacher Observation Tally but in no other variables. (4) Between groups, no one group showed statistically significant improvement over any other.

## THE STRUCTURE OF MATHEMATICS ANXIETY IN A COMMUNITY COLLEGE SETTING Order No. DA8306770

FERGUSON, RONALD DALE, PH.D. *Texas A&M University*, 1982. 67pp. Chairman: Dr. James Rollins

This study investigated whether there exists a component of mathematics anxiety in addition to the Numerical Anxiety and Mathematics Test Anxiety previously identified in MARS by Rounds and Hendel. Twenty of these Rounds and Hendel items were chosen and augmented by ten additional researcher constructed items intended to measure a mathematics anxiety factor tentatively labeled as Abstract Anxiety.

The resulting thirty item self-inventory named PHOBUS was administered to N = 365 subjects. The subjects were students in eighteen classrooms selected at random from a population of 136 mathematics classes offered during the day division of San Antonio College during the spring semester of 1982. Both principal axis and alpha method were used to initialize factor matrices. Orthogonal rotation by varimax and equimax algorithms resulted in the isolation of five factor patterns.

In terms of contribution to variability, the most important factor had heavy loadings (greater than 0.5) on the items intended to measure Abstraction Anxiety. The items extracted from MARS were partitioned into Numerical Anxiety, Mathematics Test Anxiety and into two other factors that were loosely labeled as fear of embarrassment and fear of intimidation.

A general linear model was used to compare the test-retest reliability of PHOBUS with MARS. The data did not support that PHOBUS was as reliable as a 98 item version of MARS. If MARS were shortened to 30 items, then PHOBUS compared favourably with the Spearman-Brown predicted value for the resulting reliability.

The advantages of PHOBUS over MARS lie are in the economy of administration and presence of another factor of mathematics anxiety. Factor analysis has shown that Abstraction Anxiety is the primary factor of PHOBUS.

Further research using PHOBUS should be directed towards the contribution of Numerical Anxiety, Mathematics Test Anxiety, *and* Abstraction Anxiety toward dysfunction in mathematics performance. In particular, since adolescence has been identified as a time of emerging differences in mathematics activity when sex is used as a variable, and since the middle school years are also the time of increased abstractness in mathematics, PHOBUS may prove to be useful in determining any significant interactions.

## LANGUAGE INFLUENCE ON MATHEMATICS ACHIEVEMENT OF CAPEVERDEAN STUDENTS Order No. DA8309726

FERRO, SALAZAR F., ED.D. *Boston University School of Education*, 1983. 291pp. Major Professor: J. Franklin Fitzgerald

There are many possible patterns of language usage in a bilingual program. For the purpose of this study, three basic patterns were considered: teaching entirely in English, teaching in some mixture of Capeverdean and English, and teaching in some mixture of Portuguese and English.

Specifically, the investigation was designed to study the following questions: (1) *What are the comparative results of the three instructional treatments?* (2) *Is there a statistically significant difference between male and female achievement in basic mathematics, geometry, and algebra?* (3) *What relationships, if any, exists between the dependent variables (achievement in basic mathematics, geometry, and algebra) and certain independent variables taken collectively?*

Before instruction, 89 Capeverdean bilingual students enrolled in the first year of a two-year course in basic mathematics were tested to determine English, Portuguese, and Capeverdean proficiency, and tested on three mathematical topics (basic mathematics, geometry, and algebra). The following week, instruction was given on basic mathematics. The subjects were then posttested. The same instruction and testing procedure was used with a geometry unit and an algebra unit.

The teachers presented each unit according to given instructions and all the activities were done twice. In the Portuguese/English instruction group, the activities were in Portuguese and repeated in English; in the Capeverdean/English group, they were in Caperverdean and repeated in English; in the English/English group, they were in English and repeated in the same language.

This study tends to support the hypothesis that students who have Capeverdean as a native language, taught mathematics with the Capeverdean/English treatment will increase their mean achievement scores relatively more than those taught with a English/English treatment or Portuguese/English treatment; sex does not influence the achievement; there is no interaction between treatment and content; and aural comprehension of Portuguese was the most important factor in determining mathematics achievement in the three content areas.

## AN INVESTIGATION OF THE PROBLEM-SOLVING STRATEGIES USED BY SECONDARY MATHEMATICS TEACHERS TO SOLVE PROPORTIONAL PROBLEMS Order No. DA8323834

FISHER, LINDA CANTRELL, PH.D. *The Florida State University*, 1983. 258pp. Major Professor: E. Thomas Denmark

*Purpose*. This exploratory case study investigated the problem-solving strategies used by secondary mathematics teachers to solve and teach word problems conducive to proportional solutions.

*Method*. In individual interviews 20 randomly selected teachers described their thinking as they (1) solved four problems, two depicting direct relationships and two inverse; (2) explained how they would teach two of the problems; and (3) solved four similar problems after being asked to use proportional approaches. Responses were categorized using an eight-category classification scheme. Three categories are proportional--proportion formula (a/b = c/d form), proportion strategy (correct strategies which research indicates secondary students prefer to the formula) and proportion attempt (an incorrect use of proportion). The remaining categories are no answer, intuitive, additive (a focus on difference rather than ratio which is a common error of secondary students), algebraic (a correct equation other than the proportion formula), and Other.

*Findings*. On the first task, 74% of the responses were correct. Performance was almost perfect on the direct items; only half the responses to the inverse items were correct. There was no significant change in performance when teachers attempted to use proportional strategies. Middle school teachers were less successful than high school teachers, chiefly due to difficulties with the inverse items. When simply asked to solve the problems, the teachers used a variety of strategies which tended to vary with the problem; algebra accounted for one-fourth of the solutions and proportional approaches for one-half. The proportion formula was used far more often than other proportional strategies. The additive strategy was not used. When asked to use proportional approaches, the teachers increased their use of the proportion formula. The majority indicated that they would use the same strategies to solve and teach the selected items. Few teachers used informal proportional strategies to solve or teach these problems. The most unique and ingenious solutions tended to be devised on the inverse items for which many teachers had no ready solutions.

### PROFILES OF GIFTEDNESS: AN INVESTIGATION OF THE DEVELOPMENT, INTERESTS, AND ATTITUDES OF 10 HIGHLY GIFTED INDIANA ADOLESCENTS

Order No. DA8323982

**FLACK, JERRY DAVID**, PH.D. *Purdue University*, 1983. 316pp. Major Professors: John Feldhusen, James Russell

The purpose of this study was to investigate the childhood development patterns, school histories, interests, and attitudes of gifted adolescents in order to construct profiles which would be instructive to educators and parents concerned with the development and education of gifted youths. The investigation also sought to determine whether the experiences and interests of contemporary gifted youths were similar to those reported for gifted subjects in much earlier research. The research was exploratory. Null hypotheses were not stated. It was hoped the research would suggest further avenues for experimental research.

The study was limited to gifted adolescents in Indiana. Subjects were selected from a talent pool of more than 4,000 Indiana youths who took the Scholastic Aptitude Test (SAT) in 1982, when they were 14 years old or younger. The testing was done in conjunction with the Midwest Talent Search. The composite math and verbal scores for the subjects, among the 12 highest recorded composite scores found in the talent pool, ranged from 1250 to 1360. Ages of the subjects, at the time of the study, ranged from 12 to 15.

An 80-item interview schedule was designed for the subjects and a standard interview schedule was also utilized with parents. Parents also completed a questionnaire form.

Separate interviews were conducted with each subject and his/her parents during January and February 1983, following initial letter and phone contacts. All interviews took place in the subjects' homes and all interviews were taped.

The results of the study suggested that contemporary gifted youths share many of the same developmental characteristics, interests, and school problems noted among gifted populations in previous investigations. The subjects in this study demonstrated early signs of precocity and wide-ranging interests. School boredom continued to be a problem for gifted students. Recommendations for the education of gifted students were made based on the research findings. Suggestions for additional research with the subjects and other gifted students were also offered.

### THE EFFECT OF A RECORD KEEPING SYSTEM ON STUDENT ACHIEVEMENT AND ATTITUDE IN MATHEMATICS

Order No. DA8301776

**FLANAGAN, ANALYNE**, PH.D. *University of Oregon*, 1982. 127pp. Adviser: Fay B. Haisley

The purposes of this study were to (1) determine the effect of implementing a systematic mathematics record keeping system for computational skills on student achievement and attitude;
(2) determine if a procedure for developing and implementing such a system could result in positive teacher acceptance and a change in teaching practices.

The subjects of the study were the 207 third, fifth, and sixth grade students and 21 teachers in an experimental school. The control group consisted of the 509 third, fifth, and sixth grade students from three comparable schools in the same school district in Oregon. The research reported in this study sought to measure (1) the increase of student achievement and attitude at the experimental school and compared with the control schools, (2) student achievement on criterion-reference tests, (3) teacher use of, and attitude toward the record keeping system developed, and (4) changes in teaching practices.

Norm-referenced achievement tests, a Likert-type mathematics attitude survey, criterion-referenced tests, and a teacher questionnaire were used to test the hypotheses. The first four hypotheses were tested at the .05 level of confidence using a *t* distribution. A chi square was applied to the criterion-referenced test data with an .05 level of confidence.

Significant increases in achievement were found at the fifth and sixth grade levels for the experimental students. No significant differences were documented by the attitude survey. A significant increase did occur in the number of students reaching mastery on the criterion-referenced tests, and teacher acceptance of the record keeping system was positive.

The systematic record keeping system proved successful in monitoring student learning, providing a means of evaluating student mastery and documenting student growth. Teacher attitudes were generally very favorable toward the system under study and toward the inservice program opportunities provided. Student attitudes toward math were found to be very favorable.

Changes in teaching behavior included an increase in small group instruction and attention to individual student mastery of objectives.

### A FOLLOW-UP OF SECOND AND THIRD GRADERS WHO AT ONE TIME QUALIFIED FOR TITLE I INTERVENTION BASED ON DEFICITS IN READING AND MATHEMATICS

Order No. DA8306997

**FLINTER, PAUL FRANCIS**, PH.D. *The University of Connecticut*, 1982. 114pp.

Title I compensatory education programs for low achieving disadvantaged children have been operating since passage of the Elementary and Secondary Education Act of 1965. Yet in the last 17 years, educational research has ignored the possibility that the more academically impaired of Title I elementary students might have been candidates for nonconventional secondary school programs (special education, alternative high school or dropout).

The purpose of this study was to investigate the differences in secondary school placements between pupils who earlier were placed in Title I reading and math programs, on the basis of objective achievement testing, for two successive years (experimental sample) and those in such programs for one year (comparison sample).

The experimental sample (n = 65) and comparison sample (n = 65) were drawn from a population of 758 urban Connecticut children who received Title I reading and math intervention in grades 2 and/or 3 during the 1971-72 to 1975-76 school period. The follow-up conducted at the end of the 1980-81 school year located 108 subjects, 53 experimental subjects and 55 comparison subjects.

Five experimental hypotheses, based in expectancy theory, were tested regarding (a) former Title I children's overrepresentation in nonconventional secondary placements; (b) former Title I male subjects overrepresentation in nonconventional secondary placements; (c) the relationship between nonconventional secondary placement and low academic achievement during grades 2 and 3; (d) the relationship between length of Title I intervention and type of secondary placement; (e) grade 2 and 3 achievement variables' prediction of nonconventional secondary placement.

The study found both samples to be significantly overrepresented in nonconventional secondary programs. Males' representation had not changed from the original selection ratio. Low to moderate positive correlations were observed between nonconventional placements and low achievement in reading and math. No relationship was found between length of intervention and placement but trends were noted. Word analysis skills predicted secondary placement for experimental subjects while word analysis plus total math ability predicted the comparison subjects secondary placement

The results corresponded with literature references that relationship exists between low academic achievement and changing educational status. Regardless of intervention, both samples equivalently taxed the school system for nonconventional programs.

### PUPIL PRODUCTIVITY IN ELEMENTARY SCHOOL MATHEMATICS AS RELATED TO PRINCIPAL AND TEACHER LEADERSHIP STYLE

Order No. DA8316476

**Forster, Beverly Roane**, Ed.D. *The College of William and Mary in Virginia*, 1983. 175pp. Chairman: Professor Robert Maidment

The purpose of this study was to investigate: (1) the relationship between the leadership style of an elementary school principal, as second-level manager, and the mathematics achievement of the students, and (2) the relationship between the degree of leadership style congruence of the elementary principal, as second-level manager, and the teacher, as first-level manager, and the mathematics achievement of students. Fiedler's Contingency Theory of Leadership Effectiveness provided the conceptual framework for the study.

Measurements were recorded for a sample population of 28 principals, 245 teachers, and 5373 students of grades four, five, and six drawn from an urban district in southeastern Virginia with a student population of approximately 35,000.

Four hypotheses were tested for statistically significant ($p \leq 0.05$) findings: (1) pupil gains in mathematics would be greater where principal leadership style and situation favorableness were matched, (2) pupil gains in mathematics would be greater where principal leadership style and teacher leadership style were congruent, (3) pupil gains in mathematics would be greater where principal leadership style and situation favorableness were matched and where principal and teacher leadership style were congruent, and (4) pupil gains in mathematics would be greater where teacher beliefs about mathematics and its instruction were informal and teacher competence in mathematics was high.

An analysis of variance for unequal cell size resulted in the rejection of each of the hypotheses. Significant findings, however, were found using student achievement as the dependent variable for the interaction between principal leadership style and situational conditions, for teacher leadership style, and for teacher attitude toward mathematics and its instruction.

It was concluded that there appeared to be a relationship between first- and second-level managers, teachers and principals, and the mathematics performance of fourth, fifth, and sixth grade students. The matching of principal leadership style and situational conditions as postulated by Fiedler appeared to be partially supported. Further, certain teacher-related constructs did strongly relate to student achievement in mathematics.

### THE INFLUENCE OF COMPUTER-ASSISTED INSTRUCTION AND WORKBOOK ON THE LEARNING OF MULTIPLICATION FACTS BY LEARNING DISABLED AND NORMAL STUDENTS

Order No. DA8317370

**Foster, Kelli**, Ph.D. *The Florida State University*, 1983. 118pp. Major Professor: Joseph K. Torgesen

The effectiveness of two drill and practice methods, computer-assisted instruction and workbook, was compared using six learning disabled and six normal learning students. Both instructional methods provided highly structured drill and practice of multiplication facts, but differed on several important dimensions: immediacy of feedback, individually-tailored practice of problems, and mode of presentation. A combination group/single-subject methodological approach was employed to determine any idiosyncratic or group performance differences between drill and practice methods or any group differences between learning disabled and normal students. While overall, few differences were found between the instructional methods, they did differ with respect to when learning occurred. Also, individual data suggest that for some of the students, performance varied according to the type of drill and practice employed. The performance of learning disabled and normal subjects was surprisingly similar across measures.

It was concluded that the highly structured nature of both modes of drill and practice eliminated differences in performance between the two groups. Also, while computer and workbook instruction differed on some basic structural features, these characteristics did not have a significant impact on student achievement.

### PEER TUTORING AMONG BEHAVIORALLY DISORDERED STUDENTS: ACADEMIC AND SOCIAL BENEFITS TO TUTOR AND TUTEE

Order No. DA8313837

**Franca, Vany Martins**, Ph.D. *George Peabody College for Teachers of Vanderbilt University*, 1982. 103pp. Major Professor: Paul S. Red[illegible]m

This study was designed to investigate the effect of a same-age peer tutoring procedure on the academic performance and social behavior of tutors and tutees (behaviorally disordered middle school students). A multiple baseline design across tutors and tutees was employed to evaluate the effects of this procedure on correct and error rates of responses on math worksheets. Tutors' and tutees' pre- and posttest scores on a teacher behavior checklist, two sociometric measures, self-concept scale, attitude toward math scale, and data on social interactions were compared to investigate the social and attitudinal effects of peer tutoring. The results were as follows: (a) increasd correct rates and decreased incorrect rates on tutors' and tutees' math worksheets; (b) few and inconsistent changes on teacher ratings of students' social behaviors; (c) no consistent changes on intragroup and intradyad peer nominations sociometric measures for tutors and tutees; (d) minimal changes on the peer ratings sociometric measures for tutors and tutees; (e) minimal changes on the self-concept scores for the tutors, and no differences for the tutees; (f) significant improvement in attitudes toward math for tutors and tutees; (g) a significant increase in positive social interactions between tutor and tutee in each dyad, when the intervention was in effect; and (h) less frequent negative social interactions between tutor-tutee, during the peer tutoring condition as compared with baseline.

### ACHIEVEMENT MOTIVATION CHANGES WITH TITLE I - MATHEMATICS STUDENTS IN A MIDDLE/LOWER CLASS SECONDARY SCHOOL

Order No. DA8305231

**Fremouw, Laura-Jean**, Ed.D. *University of Northern Colorado*, 1982. 117pp.

The purposes of this study were to measure the change in achievement motivation with Title I - Mathematics Students in a middle/lower socio-economic class secondary school. Research hypotheses were: (1) There would be a change in achievement motivation scores using a standardized testing instrument, (2) Four interests that develop and mature through learning experience--interest in school, dependency, responsibility and self-fulfillment--would show positive and significant gains, (3) Six basic drive needs: protectiveness caution, self-assertion, sexual identity, aggressiveness and self-indulgence would show variable changes in these drives, (4) Students who completed the Title I - Mathematics Program in grades ten through twelve would show a greater increase in achievement motivation scores than those in grade nine, (5) the School Motivation Analysis Test would show evidence of premature school withdrawal for Title I - Mathematics students.

One hundred twenty Title I - Mathematics students were pre and post tested; fourteen dropped-out of school.

Findings indicated: (1) Using the five derivative scores of Total Autism-Optimism, Total General Information-Intelligence, Total Integration, Total Personal Interest or Total Conflict as a predictor of dropouts only Total General Information-Intelligence was statistically significant, with a probability of 0.7375. Statistically there was no real difference between the dropouts and those who completed the program. (2) The Duncan Multiple Range Test for White versus Hispanic versus Black indicated the subjects were homogeneous students. (3) t-Test scores measuring change in motivation showed a slight decrease for the six primary drives and a slight increase in acquired interest patterns. (4) Female Total Personal Interest was half that of males. (5) Students in grades ten through twelve showed slight decreases in learned interest while grade nine males and

**females** slightly increased and decreased respectively.

**Conclusions** reached were: (1) The SMAT was able to measure statistically significant changes in achievement motivation. (2) The four interests that develop and mature through learning experiences showed positive but not significant gains. (3) The six basic drive needs all showed slight decreases except assertiveness. (4) The students who completed the Title I - Mathematics Program in grades ten through twelve did not show a greater increase in achievement motivation scores than those in grade nine. (5) The SMAT will not provide evidence of premature school withdrawal for Title I - Mathematics students using the derivative score for Total Personal Interest (Motivation).

### ANALYSIS OF THE USE OF INFERENTIAL REASONING BY EIGHTH, TENTH AND TWELFTH GRADE STUDENTS

**Order No. DA8319895**

**Friel, Susan N.**, Ed.D. *Boston University School of Education*, 1983. 269pp. Major Professor: Dr. Carole E. Greenes

The purpose of this study was to investigate how advanced mathematics students in the eighth, tenth and twelfth grades used inferential reasoning in the solution of problems that required knowledge of elementary number theory. Inferences were classified based on the level of ambiguity involved, simple or complex; the number of pieces of information used, single-item or combined-item; the type of inference, simple single-item, simple combined-item, complex single-item or complex combined-item; and the purpose of the inference (seventeen inference codes were identified). The use of inferences classified by type was of primary interest. Also investigated were the procedures subjects employed to obtain, maintain and control information.

Each of the 18 subjects, 6 from each grade, solved ten different problems in two to three sessions. Each problem involved the identification of a "mystery" whole number in the range of 1 to 1000 on the basis of clues that were provided. As the subjects interacted with the computer program that presented the problems, they were asked to "think aloud". Using transcribed, typewritten protocols and all paper-pencil notations recorded by subjects, protocols were coded employing a coding scheme developed by the investigator.

*Findings*. More combined-item than single-item inferences and more complex than simple inferences were drawn. Simple single-item inferences occurred with less frequency than the other types of inference.

The majority of inferences at the beginning of the solution process were complex single-item inferences, during the middle, complex single-item or complex combined-item inferences, and, at the end, simple combined-item inferences. Subjects developed algorithms to solve the problems after the third or fourth problem solved.

Subjects' use of the hypothesis testing strategies of verification or verification/negation was related to grade level and to preferences for generating candidates for the mystery number. During the solution process, subjects recorded more clue information than information obtained from inferences.

### INTERACTION OF GENERAL REASONING ABILITY AND SELECTED AFFECTIVE VARIABLES WITH INSTRUMENTAL AND RELATIONAL TREATMENTS IN JUNIOR HIGH MATHEMATICS

**Order No. DA8227647**

**Friske, Joyce Stivers**, Ph.D. *The University of Texas at Austin*, 1982. 293pp. Supervisor: L. Ray Carry

This study investigated the interactive relationship between three aptitudes and two instructional treatments, and their effect on mathematics learning and transfer. This investigation also sought to extend the theoretical basis for treatment differences, and to test certain affective characteristics in terms of their potential to interact with instructional treatments. Need for achievement (NFA), locus of control in mathematics (LOC-MTH), and general reasoning ability (GRA) were selected as aptitudes for this experiment. The Necessary Arithmetic Operations (NAO) test measured GRA. Two Likert-type scales, Achievement Attitude (AA) and Mathematics Attitude (MA) measured NFA and LOC-MTH. The Achievement Attitude Scale was developed by the investigator. All aptitude measures were internally consistent. Each of the two researcher-designed treatments contained seven individual self-study lessons on volume. The lessons developed the concepts of volume of prisms, pyramids, cylinders, cones, and spheres. Related area concepts were included in one lesson at the beginning of the unit. The instrumental treatment used a high-support, rule oriented, "show and tell" approach to develop the concepts, while the relational treatment used a low-support inductive approach for developing and relating the concepts. The relational treatment allowed the learner to organize structures through questioning, describing relationships, and making estimates concerning the volume of particular solids. The experiment was conducted using of 8th and 9th grade students in eight classes of algebra I and pre-algebra in northeastern Oklahoma. Following the assessment of aptitudes, the randomly assigned seven-day treatments were administered. After the completion of the treatment, the criterion test was given. Complete data was obtained for 236 students. Four ATI hypotheses and one hypothesis questioning the relative effects of the treatments were tested. Using multiple regression techniques, the analyses yielded no significant differences for all hypotheses. None of the information gained from this experiment refutes the possibility of the hypothesized relationships.

### THE EFFECT OF KNOWLEDGE OF LEVEL OF MATHEMATICS BASIC SKILLS ON MATH ANXIETY

**Order No. DA8318746**

**Frye, Elizabeth Weimer**, Ed.D. *West Virginia University*, 1983. 137pp.

The purpose of the study was to conduct an investigation and evaluation of one aspect of many existing math anxiety treatments, namely, the diagnosis of basic math skills. Several broader questions related to this study were also investigated. These included the following: (1) Can math anxiety be effectively reduced within existing college math departments? (2) Is it possible to reduce math anxiety significantly without the services of a professional psychologist? (3) What measures can be taken within existing college programs that could reduce math anxiety?

The Mathematics Anxiety Rating Scale (MARS) was utilized to screen five different sections of three freshman mathematics courses at Fairmont State College, Fairmont, West Virginia. The study was a two-group, experimental/control, design with a MARS posttest and pretest for each group. The 50 students with the highest anxiety scores on the MARS pretest were randomly assigned to either the experimental (Group I) or control group (Group II). All of the subjects completed the entire project.

Subjects in both groups were given two diagnostic tests of mathematics basic skills in arithmetic and elementary algebra prepared by the College Entrance Examination Board. Only the members of Group I were given knowledge of the results of these diagnostic tests during an interview with the research director. At that session, each Group I subject received the test results and a prescription for remediation of diagnosed math basic skills tests.

Analysis of covariance, with the MARS pretest scores as covariate, was utilized to statistically adjust the MARS posttest scores of the two groups ($n = 25$ for each group). An F-ratio of 6.1752 gave a significant difference in adjusted MARS posttest means of the two groups at the .05 level.

The results of this study indicate that the effective use of diagnosis of mathematics basic skills deficiencies and prescription for remediation may be related to lowered math anxiety scores. The study was designed to utilize existing college structures. Future similar research in other locations would appear desirable considering the results of this study.

### MICROCOMPUTER FUTURES: PREDICTIONS OF SELECTED FACULTY MEMBERS IN MISSOURI SECONDARY SCHOOLS

**Order No. DA8310390**

**Fuchs, Curtis Ray**, Ph.D. *University of Missouri - Columbia*, 1982. 165pp. Supervisor: Dr. Arni Dunathan

*Purpose*. The purpose of this study was to predict the use and expansion of microcomputers in Missouri secondary schools. This study was based on the rapid expansion and use of microcomputers in education today as well as the need to develop systematic approaches as education enters the microcomputer age.

*Procedure*. Three separate Delphi were conducted as part of this study. They included: secondary business educators, secondary math educators and secondary library/media personnel in Missouri. All three Delphi were conducted simultaneously with each expert asked to predict the year in which the microcomputer would be considered an indispensable tool in his or her respective curriculum or center. The participants were sent a summary of the results and asked to study them and to evaluate and revise their estimates if they thought it appropriate. Three rounds were conducted in each of the Delphi.

*Findings*. The consensus of opinion of the business committee was that microcomputers would be an indispensable part of the business curriculum by 1985. For the math and library/media committees, the consensus was that microcomputers would be indispensable to their respective areas by 1987. The comments indicated that the business committee felt microcomputers were relevant and a vital part of their curriculum. The math committee comments indicated that microcomputers were important but considered an "extra" in their curriculum. The library committee associated increased efficiency and service with microcomputers.

*Conclusions*. (1) The business departments in Missouri secondary schools are the most receptive to including microcomputers in their curriculum. (2) Additional inservice training or course work should be first implemented for business teachers. (3) Business educators should be considered for leadership roles in the use and expansion of microcomputers. (4) The growth of microcomputers in Missouri secondary schools will be impeded due to current financial conditions. However, lower costs of hardware, which is anticipated, could ease the financial burden. (5) There is a need to produce better quality software.

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## THE EFFECTS OF AUTOMATICITY TRAINING ON AUTOMATIC RECALL AND RETENTION OF MULTIPLICATION WITH EIGHT- AND NINE-YEAR-OLDS Order No. DA8322926

**GAILEY, JUDITH ANNE**, ED.D. *University of Arkansas*, 1983. 205pp. Major Professor: Robert G. Stephens

Automaticity training effects on automatic recall and retention of multiplication facts were explored during eight- and nine-year-old subjects' stable brain growth and development period. For ten days, all subjects received the ten-minute training program (zero facts on day 1 to nine facts on day 10). Using Flash-X tachistoscopes, facts were flashed at one twenty-fifth second for experimental subjects' automaticity training. Using 35 mm slides, facts were flashed at two seconds for control-1 subjects' mastery training. Using flash cards, facts were flashed at four seconds for control-2 subjects' mastery training. Experimental and control-2 subjects were paired and received immediate feedback. Control-1 subjects observed individually.

In thirteen randomly assigned self-contained classrooms, 189 white subjects were pretested with the Cattell Culture Fair Intelligence Test (Part I) for visual processing scores (VPS). Multiplication facts tests A and B were used in pre-, post-, and retention testing under timed conditions (first 90 seconds of testing) for power scores (P1S, P2S, P3S) and untimed conditions (test completion) for achievement scores (A1S, A2S, A3S). Of the VPS, P1S, and A1S one-way ANOVAs, only third grade P1S were significant. Gain scores were used to statistically control differences.

Third and fourth grade power posttest gain scores ($p = .0006$; $p = .0104$) and power retention gain scores ($p = .0076$; $p = .0013$) were significant as were fourth grade achievement retention gain scores ($p = .0044$). VPS covariate was significant in third grade A2S and P3S ($p = .011$; $p = .003$) and fourth grade P2S ($p = .041$). P1S covariate was significant in third and fourth grade P2S ($p < .001$; $p < .001$), P3S ($p < .001$; $p < .001$), and third grade A2S and A3S ($p = .009$; $p = .013$). Main effects of treatment in third and fourth grade P2S ($p = .010$; $p = .023$) and sex in third grade P3S ($p = .044$) were significant.

Although no method proved superior and sex differences were not significant, training methods were a catalyst in automatic multiplication recall and retention. Rather than visual processing, the Cattell, measuring pattern recognition skills, interacted with the multiplication facts learning curve influencing third grade performance greater than fourth grade. As a cognitive entry characteristic, P1S was more effective than VPS.

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## RAISING THOUGHT PROCESSES OF FIVE-YEAR-OLD CHILDREN TO IMPROVE ACQUISITION OF MATHEMATIC ABILITY Order No. DA8317585

**GAMBLE, SUSANNE MEDLIN**, ED.D. *Mississippi State University*, 1983. 81pp. Director: Gloria C. Correro

The nature of this study was to determine whether training in prerequisite abstract ability would improve the acquisition of conservation. It focused specifically on how abstract ability is reflected in mathematical concepts.

The literature cited in this study indicated a direct relationship between precognition concepts and pre-mathematical concepts. The same mental operations necessary for abstract ability are necessary for mathematical constructs.

The hypotheses which were generated from the study for treatment were: (1) When pretest scores are considered for covariants, there will be no significant differences in the posttest mean scores on the mathematical section of the *Stanford Early School Achievement Test* (Madden & Gardner, 1969). (2) There will be no significant difference between the experimental and control groups' ability to conserve before and after treatment as measured by *Piaget's Task Test of Constancy of Mass and Liquid* (Piaget & Inhelder, 1964).

The population consisted of 96 kindergarten children from the Cooperative Demonstration Kindergarten Project. The children for the project were selected through a process of stratified randomization. This assumes that they were representative of the school district.

The first null hypothesis was retained because the significance did not reach the .05 level; however, the experiment did reach the .10 level, thus indicating a trend toward the acquisition of mathematical ability through training in the prerequisites of abstract thinking.

The second null hypothesis was rejected in favor of the alternative hypothesis with .01 significance. Evidently, the training in pre-abstract concepts affected the children's ability to conserve as measured by *Piaget's Task Test of Constancy of Mass and Liquid*.

Instruments used in the study were the *Stanford Early School Achievement Test, Levels I and II* (Madden & Gardner, 1969) and *Piaget's Task Test of Constancy of Mass and Liquid* (Piaget & Inhelder, 1963). Level I of the *Stanford Early School Achievement Test* was used for the mathematical pretest and Level II was used for the mathematical post-test. *Piaget's Task Test of Constancy of Mass and Liquid* (Piaget & Inhelder, 1963) was used to measure cognition.

The mathematical data were analyzed through an analysis of covariance. The cognitive data was analyzed through the chi-square statistical procedure. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

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## SIMULTANEOUS SYNTHESIS, BEHAVIOR REGULATION AND THE FACTOR STRUCTURE OF ARITHMETICAL PERFORMANCE Order No. DA8308000

**GAROFALO, JOSEPH FRANCIS**, PH.D. *Indiana University*, 1982. 114pp. Chairperson: Dr. John F. LeBlanc. Director: Dr. Frank K. Lester, Jr.

This study addresses the issue of the apparent dual nature of arithmetic. There exists a body of correlational and factor analytic research which provides substantial evidence of a computation-problem solving dichotomy in arithmetical performance. This dichotomy is indicated by studies finding low correlations between computation and arithmetic problem solving tests and by studies finding tests of each to load on different factors. However, the apparent dichotomy is not unequivocal since several studies reveal a strong overlap between these two aspects of arithmetic, either by finding appreciable correlations between tests of each, by finding tests of each to load together on oblique factors and/or by finding tests of each to load together on a single factor.

This study analyzes the structure of arithmetic performance in terms of Das, Kirby and Jarman's factor analytic model of cognitive processes which is based on Luria's theory of the anatomical and functional organization of the brain. The model postulates three domain-general factors underlying all cognitive activity: simultaneous synthesis (occipital and parietal lobes), successive synthesis (temporal lobes) and behavior regulation (frontal lobes). The approach taken here examines the relationship between performance on computation tests and performance on quantitative ability and arithmetic problem solving tests by comparing the patterns of factor loadings they each have on a set of reference factors. Since arithmetic tests will load together for a variety of reasons, including having content, format and one or more underlying factors in common, it was felt that a clearer pattern of differences would emerge if each arithmetic test was analyzed separately with the reference factors.

The results indicate that performance on tests of quantitative ability and arithmetic word problem solving are primarily related to the simultaneous synthesis factor while performance on a computation test is primarily related to the behavior regulation factor. Performance was also interpreted with respect to the different types of domain-specific knowledge necessary for successful performance on the problem solving and computation tests. The results support a dual nature interpretation of arithmetical performance.

### AN INVESTIGATION INTO THE COMPUTATION AND CONSERVATION PERFORMANCE OF LEARNING DISABLED AND NONDISABLED CHILDREN IN SECOND GRADE

Order No. DA8304011

**Garofano, Neil Paul**, Ed.D. *Columbia University Teachers College*, 1982. 133pp. Sponsor: Professor Margaret Jo Shepherd

This study was designed to examine the computational and conservation skills of LD and ND children. Also of interest was the existence of relationships between the two variables.

The descriptive design utilized 30 LD and 30 ND second grade subjects of normal intelligence from suburban New Jersey schools.

Stimulus materials for the calculation task included 24 addition and subtraction sentences which included 16 open sentences. The Conservation Assessment Kit - Conservation, Form A (Goldschmid & Bentler, 1968) served as the conservation materials.

Subjects were individually presented with the calculation and conservation tasks in a counterbalanced order. The examiner read each of the calculations aloud during random presentation to the subjects. Children had manipulative materials available for solution and were asked to describe their strategy during or after their calculation attempt. Following accurate solution of each problem, the subjects were directed to provide alternate strategic justifications. Conservation judgements were measured in six areas. Following a correct judgement, the subjects were asked to rationalize their judgement using as many explanations as possible.

Results of statistical analyses pointed to superior calculation and conservation performance by the ND subjects. The differences in performance were most evident with regard to the generally higher numbers of ND students who could provide correct justifications for correct answers to the computations and appropriate explanations for accurate conservation judgements. Relationships between the two variables were moderately high when conservation performance was correlated with strategy utilization. No significant relationships were discovered between conservation judgement and calculation accuracy.

The implications of the present study call for studies which investigate older children's performance on more difficult and varied tasks in arithmetic and cognitive functioning. Should such studies provide confirmation of the present investigation, instructional techniques using more generalized, structured and sequential problem solving options may improve the performance of LD students.

### A STUDY OF THE RELATIONSHIP OF MEXICAN TEACHERS' ATTITUDES TO THE MATHEMATICS ACHIEVEMENT OF THEIR PUPILS

Order No. DA8320708

**Garza-Buentello, Maria Teresa**, Ph.D. *Stanford University*, 1983. 426pp.

This research aimed at: (a) Describing and comparing the attitudes of various defined groups of teachers and determining whether there are different attitudes among teachers working in different socio-cultural contexts (e.g., public versus private school teachers, rural versus urban school teachers); (b) Investigating the factor structure of a scale designed to measure those Mexican teacher attitudes and beliefs that are relevant to their pupils' achievement; (c) Identifying empirically teacher attitudes, beliefs, and opinions associated with student achievement scores.

This correlational field study focused on presage, context, and product variables. A questionnaire (OAM) was designed and administered to a sample of 5th-grade Mexican teachers ($N$ = 381) (a) to obtain the teachers' background information and school characteristics; and (b) to measure attitudes relevant to teacher classroom behavior (e.g., attitudes toward the students, textbooks, traditional and progressive teaching practices, the occupation of teaching, and discipline techniques).

Students' scores on standardized achievement pre- and posttests on mathematics, social sciences, natural sciences, and Spanish were used to compute class means. Analysis of teacher measures included a principal components analysis and factor analyses of the OAM questionnaire. From the results of these analyses and a rational-empirical approach, 14 teacher attitude scales were developed and correlated with the student data. Correlations were obtained for all teachers and for various teacher sub-groups: public-urban, public-rural, and private-urban. Teacher scale scores were also correlated with school characteristics and teacher background information.

The 14 attitude scales were used to describe an attitude profile of the Mexican teachers. For some scales there were no significant differences among the mean responses of teachers working in different socio-cultural contexts. Mexican teachers favored traditional or nonprogressive teaching methods and social concern objectives. They expressed high concern with student affect, and they did not believe in authoritarianism or in strict disciplinary techniques. Teachers expressed high respect for the teaching career and low frustration about teaching and dislike of teaching.

Other scales showed that significant differences in the teacher responses could be associated with the school's control and location. Rural school teachers seemed to give much less importance to mathematics over other subject matters and to progressive teaching practices than urban school teachers did. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

### A STUDY OF COGNITIVE GAINS OF FOURTH, FIFTH AND SIXTH GRADE STUDENTS ACROSS TWO YEARS OF TITLE I

Order No. DA8228890

**Gates, Robin Boyd**, D.Ed. *The Pennsylvania State University*, 1982. 243pp. Adviser: Patrick D. Lynch

This study was designed to compare the cognitive effects of Title I programs in elementary schools in reading and mathematics for two years. The study design was *ex post facto* and contrasted whether gains made in Year II, as measured, were equal to or less, than those made in Year I. The second part examined whether two-year gains in reading and mathematics were equal.

The districts were identified by the Pennsylvania Department of Education Title I Office. Each district was selected using the procedures outlined by the Pennsylvania Educational Quality Assessment (EQA) program, using the 1981 District Average Daily Membership (ADMS) and Average Market Value/Personal Income Aid Ratio. Standardized test results of the Title I clients were secured by the Research Divisions of the Pennsylvania Department of Education.

The following were the null hypotheses related to the purposes of this investigation: (1) There will be no significant difference in reading comprehension gains between year one and year two. (2) There will be no significant difference in mathematical achievement gains between year one and year two. (3) There will be no significant difference between growth in reading comprehension and growth in mathematical achievement in year one. (4) There will be no significant difference between growth in reading comprehension and growth in mathematical achievement in year two. (5) There will be no significant difference between two-year gains in reading comprehension and mathematical achievement.

A list of the findings were as follows: (1) Achievement growth in reading comprehension was significantly greater in Year II than in Year I. (2) There was no significant difference in total mathematics gains between Years I and II. (3) Achievement growth in mathematics was greater than in reading for both years. (4) Title I reading and mathematics programs did produce significant cognitive gains for both years. (5) Gains in both reading and mathematics were highest in grade five for both years.

## THE EFFECTIVENESS OF CHISANBOP AND FINGERMATH RECKONING IN REMEDIATING COMPUTATIONAL WEAKNESSES OF FOURTH AND FIFTH GRADE COMPENSATORY ARITHMETIC STUDENTS

**Order No. DA8313438**

**Gill, Robert Jerome, Ed.D.** *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 124pp. Chairperson: Maurie Hillson

The purpose of the study was to investigate the effectiveness of the Chisanbop and Fingermath reckoning system for remediating arithmetic computational weaknesses among fourth and fifth grade compensatory education students in the Old Bridge, New Jersey, Public School District.

The research was conducted using the population of 161 students in 13 elementary schools. Nine teachers provided instruction to three groups: Chisanbop, N = 51; Fingermath, N = 56; Control, N = 54. Three teachers were trained according to Chisanbop procedures. Three were trained according to Fingermath procedures. The three Control group teachers received no finger reckoning training of any sort. Treatment began in November, 1980 and ended in April, 1981. Pre and posttesting instruments included the Comprehensive Test of Basic Skills, the Key Math Operations sub-tests, and the Wide Range Achievement Test Arithmetic Section. Delayed posttesting using the CTBS computations sub-test was completed in June, 1981, sixty days after treatment ended.

Seven null hypotheses were formulated. Analysis of covariance was used to test for statistical significance. The alpha level chosen was .05.

Results indicated that the Chisanbop and Fingermath group gains were statistically significantly better than the Control group in subtraction, but not in addition, multiplication, or division. In fact, the Control group performed better than the Chisanbop group in multiplication and division. On concepts and applications sub-test scores, no statistically significant differences between groups was found.

Schools where Fingermath teachers taught showed greater gains in computations than in schools where Chisanbop teachers taught. Delayed posttesting results favored the Control group, since the scores were statistically significantly better than the Chisanbop group and not different from the Fingermath group. At posttesting the Fingermath scores had been statistically significantly better than the Control and Chisanbop was not statistically significantly different from the Control group.

## A NATIONAL SURVEY OF URBAN GIFTED EDUCATIONAL PROGRAMS

**Order No. DA8229116**

**Gillespie, Wilma Joan, Ph.D.** *University of Denver*, 1982. 225pp.

This study described the current status and future direction of public school gifted programs in a sample of 100 cities of 100,000 or more population in 41 states. A secondary purpose was to identify gifted programs meeting criteria of K-12 comprehensiveness, Ethnic equitability, Inclusive identification criteria, Organizational-curricular balance, Wide participation, and Durability despite environments of educational, social, and financial change.

The survey instrument collected information from 80 Gifted Program Coordinators or Special Education Directors. Respondents rated extent of Gifted Program implementation, identification procedures, curriculum, participation, school issues and priorities. Additional questions covered years of program operation, ethnic proportions, and long range plans.

Differentiated gifted programs were found in 98% of the cities, implemented to great or some extent in 94%. Elementary programs were in 96%, Middle School/Junior High 87%, and Senior High 70%. Comprehensive K-12 programs were in 31% and Grades 1-12 in 24%. Two-thirds had ethnic proportions representative of the city.

Ninety percent used multiple identification procedures. Most-used were Standardized Achievement Tests, Group-Committee screening, and Teacher nomination. Intelligence tests were used moderately.

Major teaching-organizational alternatives were Independent Study, Creative problem-solving, Logic/critical thinking, Mainstreaming with resource room, Enrichment, and Acceleration. All Senior Highs provided Advanced Placement. Major differentiated curricula were Language Arts, Math, Science, Computer Education, and Social Sciences. Two-thirds used Performing Arts, Affective Education, Foreign Language and Career Education.

Gifted programs had wide parent-community-business participation; 95% had district-level systems for participation. Teacher inservice, College/University programs, and programs for gifted youth were in 80% of the cities.

District-level gifted program evaluation related to gifted program long range plans in 78% of the districts. Major funding source was District Budget, with State or Federal funds used to much less extent. Critical school issues were Improving achievement, Diminishing financial resources, Decreasing enrollment, Special Education, and Educational technology. Priority goals were in areas of Basics, Special Education, Parent-Community relations, Discipline, Gifted Education and Career-Vocational Education.

Model programs meeting criteria were in 17 cities K-12, in 12 cities Grades 1-12, representing 21 states and Washington, D.C. Two-thirds of the states had model programs except K-12 comprehensiveness.

## MATHEMATICS PERFORMANCE OF STUDENTS WITH EQUAL ENTRY LEVEL SKILLS BUT DIFFERING LEVELS OF SELF-CONCEPT

**Order No. DA8321610**

**Glenn, William Campbell, Ed.D.** *New Mexico State University*, 1983. 72pp.

Many educators support the belief that the positiveness of a student's self-concept directly influences his ability to learn and that raising the positiveness of self-concept of the student should result in greater academic achievement for that student.

This study examines the validity of the assertion that students with equal intellectual abilities but differing levels of self-concept will show differing rates of learning in a classroom situation.

Data were collected from 375 sixth-grade students from the Las Cruces Public Schools. Achievement scores were taken from the Comprehensive Tests of Basic Skills (CTBS) math and reading sections and labeled as Entry Level Skills (ELS). The Academic Self-Descriptive Inventory (ASDI) was used to collect self-concept/self esteem scores. Students were then assigned to one of the following groups:

high SC/SE, high ELS
high SC/SE, low ELS

low SC/SE, high ELS
low SC/SE, low ELS

Students were given a pretest which required them to calculate the areas of three- and four-sided figures, a skill they had not been taught previously. Following the pretest, an instructional unit on solving area problems was presented. Following this unit of instruction, a posttest was administered, and a math performance gain score was derived.

A two-way analysis of variance was applied to the mean gain scores. The high ELS group achieved a higher mean gain score than the low ELS group. However, no significant differences were found between students with equal entry level skills but differing levels of self-concept. Thus, the level of positiveness of self-concept did not have any significant effect upon the gain scores of the groups.

Pearson product-moment correlations were calculated between the self-measures and achievement. None of the correlation coefficients between math gain and the self-measures was significant.

Finally, a significant multiple correlation coefficient was found between math gain scores and the CTBS math and reading achievement measures. The addition of the various self-measures to the combined achievement measures did not significantly increase the strength of the correlation coefficient.

### EXPLORATION OF TEACHER CLASSROOM ACTIVITIES RELATING TO CLASSROOM ENVIRONMENTS: AN APPROACH TO STUDYING TEACHER EFFECTIVENESS

Order No. DA8322977

GOHS, DEBORAH ELLENBERGER, PH.D. *University of Kentucky*, 1983. 215pp. Director: Dr. Edward Kifer

Student perceptions of classroom environments were used to explore teacher effectiveness. Student perceptions were viewed as playing a "mediating" role between the actions of the teacher and the achievement of the students. A review of the literature demonstrated that student perceptions of aspects of classroom environments were related to student achievement.

The major focus of this study was to determine the relationships between six teacher classroom activities which are amenable to change (i.e., homework, groupwork, lecturing, discussion, ability grouping, and seatwork) and student perceptions of classroom environments. Also of interest was whether these relationships between teacher activities and environments depended on subject area (i.e., mathematics, science, or social studies) and/or grade level (i.e., seventh or ninth grade).

Th Keesling-Wiley approach which took into account student background and the context of the classroom was used to analyze the data. The results of this analysis indicated that the frequency of homework, groupwork, and lecturing exerted a significant influence on several aspects of classroom environments while the influence of ability grouping, disucssion, and seatwork was minor.

The effects of teacher activities, however, depended on subject area and/or grade level. An increase in homework (to at least once a week), for example, had a positive influence on the environment in seventh and ninth grade science classrooms; an increase in groupwork (to at least once a week) had a positive influence in seventh grade mathematics classrooms while an increase in lecturing (to between once and twice a week) had a positive influence in seventh and ninth grade mathematics and seventh grade science and social studies.

### THE EFFECTS OF A COGNITIVE-BEHAVIOR INSTRUCTIONAL STRATEGIES TREATMENT ON PUPIL ACADEMIC ENGAGED TIME

Order No. DA8313975

GOIRAN, ANNE FONTAINE, ED.D. *University of Northern Colorado*, 1983. 244pp.

The purpose of this study was to determine whether a Cognitive-Behavior Instructional Strategies (CBIS) treatment program, based on the theoretic and empirical studies of cognitive-behavior modification, was effective in increasing pupil academic engaged time. The CBIS treatment was assessed by the Cognitive Mediation Assessment Instrument (CMAI) and the Pupil Academic Engaged Time Observation System (PAETOS) as they effected the independent variable, or the seventh grade math class of the University of Northern Colorado Laboratory School.

The pupils of the seventh grade ($N = 53$) were randomly assigned at the beginning of the academic year to one of two math groups. The Multiple Response Permutation Procedure (MRPP) was used to test for possible differing effects due to the CBIS treatment between groups ($p \leq .05$). Statistical analyses of the pre-test data resulted in no significant differences between the groups on the combined CMAI with the PAETOS ($p = .446$) on the CMAI alone ($p = .470$) and on the PAETOS alone ($p = .544$), further establishing homogeneity of groups prior to treatment. Statistical analyses of the post-test data indicated no significant difference between the groups on the CMAI post-test scores alone ($p = .760$). Significant differences between groups were found on the combined CMAI with PAETOS post-test scores ($p = .022$), and on the PAETOS alone ($p = .0003$). These significant differences are attributed to the CBIS treatment effect.

Statistical and non-statistical findings of this study demonstrate that the CBIS treatment programs was effective in increasing pupil academic engaged time. The findings support the use of the PAETOS as a valid and reliable instrument for assessing pupil's academic *behavior*. Additional research needs to be conducted in order to create a valid and reliable cognitive-mediation assessment instrument. The CBIS treatment program appears to be a viable teaching-learning tool, appealing to the natural instructional methods of teaching and to the natural learning modes of pupils.

### THE EFFECT OF THE HAND-HELD CALCULATOR ON MATHEMATICS SPEED, ACCURACY, AND MOTIVATION OF SECONDARY EDUCABLE MENTALLY RETARDED STUDENTS (GRADES 7-9)

Order No. DA8226927

GOLDEN, CONSTANCE KIBBEE, ED.D. *West Virginia University*, 1982. 168pp.

The purpose of the investigation was to determine the effect of using the hand-held calculator with secondary educable mentally retarded students (grades 7-9) to increase speed, accuracy, and motivation in working algorithmic problems in the four basic areas of addition, subtraction, multiplication, and division. The rationale for the study was that the hand-held calculator might be a device that could free the EMR student from the laborious tasks necessary to master algorithms, so that time could be devoted to algorithm application and concept development.

The population sample was comprised of 50 secondary EMR students (23 experimental and 27 control) from Wood County, West Virginia. Four intact class units (2 experimental and 2 control) were randomly selected from eight available junior high schools. The students ranged in IQ from 50-70 and came from middle to low socio-economic backgrounds.

A multiple time-series design encompassing two pretests, a treatment, and two post-tests was implemented during twelve weeks. The treatment consisted of systematic calculator instruction in addition, subtraction, multiplication, and division for the experimental group and traditional instruction in the same areas for the control group.

An analysis of covariance was used for interpreting test results. The dependent variables were speed acquisition, speed retention, accuracy acquisition, and accuracy-retention. The variables were further examined in relation to total group, grade level, sex, and separate algorithms with pretests being used as covariates.

Motivation was examined prior to the administration of the first and second post-tests. The *t* test was used to determine significance.

The analysis of covariance indicated the following differences: (a) the experimental group performed significantly better in multiplication and division for speed acquisition and retention; and (b) the experimental group performed significantly better in total group, grade level, sex, subtraction, multiplication, and division in accuracy acquisition and retention. The *t* test indicated a positive reaction toward using the calculator.

The hand-held calculator appears to be a device that can positively affect multiplication and division speed. It also appears to affect the subtraction, multiplication, and division accuracy for EMR males and females in grades 7-9.

### THE RELATION OF GUIDED IMAGERY IN SCHOOL AGE CHILDREN TO ACADEMIC PERFORMANCE AND ACHIEVEMENT INDEPENDENT OF ABILITY

Order No. DA8305262

GOLSHEVSKY, MORDECAI M., PH.D. *Florida Institute of Technology*, 1982. 68pp.

After 30 youngsters in 7th and 8th grade were introduced to guided imagery practice items they were asked to produce images on the themes "doing schoolwork"; "teacher. Your most recent teacher" and "homework". The produced images were rated either negative, neutral, ambivalent or positive by licensed school psychologists and correlated to teacher evaluations of the child's class workstyles and Wide Range Achievement Test scores in arithmetic and reading. WISC-R full scale I.Q. scores were obtained and statistically controlled. Results showed a significant correlation between the guided imagery and teacher evaluations both when intelligence was and was not controlled. No significant relationship between the guided imagery and achievement was found.

To measure the reliability of a guided image 10 youngsters were requested to produce guided images twice with a minimum of one week between trials and were rated by the school psychologists. They were highly correlated. To measure the reliability of teacher evaluations 10 teachers were asked to evaluate their students twice with a minimum of one week between evaluations. The results were highly correlated and significant at the .001 level of significance.

### A COMPARISON OF TRADITIONAL AND RASCH EQUATING METHODS Order No. DA8311838

Golub-Smith, Marna Lee, Ph.D. *Columbia University*, 1983. 117pp.

The purpose of the study was to compare the adequacy of traditional and Rasch methods of test score equating when applied to minimum competency tests of basic skills. Five methods were compared in the study: two variations of equipercentile, two variations of linear, and Rasch. The tests upon which they were applied were Forms A through D of the New Jersey Minimum Basic Skills sixth grade mathematics and ninth grade reading tests.

In order to compare the methods, the criterion of "equating drift" was chosen. To measure "equating drift", Form D of both the reading and mathematics tests were equated to the base Form A via two routes--directly and indirectly through a chain of six previous links. The differences between the sets of equated scores derived from the direct vs. indirect linkages were considered "equating drift" or error. All equatings used the anchor test method design for data collection.

Prior to conducting the equatings, both the Total T fit statistics produced by BICAL and plots of the stability of the difficulty estimates for the common anchor items were analyzed as a means of studying the relative fit of the data to the model. While both indicators pointed up violations of some of the assumptions of the Rasch model, fit of the data to the model was judged to be relatively good.

To compare the sets of equivalent scores resulting from the direct vs. indirect equatings for each method a mean square discrepancy index was used. When calculated across the entire distribution, the Rasch method produced the least error in both the mathematics and reading equatings. However, when calculated across the region of the score scale near the cutting score, the traditional linear methods, Levine for mathematics and Tucker for reading, produced the least error. While the absolute discrepancies between direct and indirect linkages for all methods were small, they were large enough to mean the difference between passing and failing for a few thousand students.

In conclusion, the investigator felt that the decision regarding the selection of an equating method was both a professional and political judgement.

### THE RELATIONSHIP OF BELIEFS ABOUT MATHEMATICS, MATHEMATICAL SELF-CONCEPT AND ARITHMETIC SKILLS TO MATHEMATICS ANXIETY AND PERFORMANCE IN BASIC STATISTICS Order No. DA8226758

Gourgey, Annette Farha, Ph.D. *New York University*, 1982. 150pp.
Chairman: Ralph H. Goldner

The purpose of the present study was to determine the relative contributions of acceptance of erroneous beliefs about mathematics, self-concept regarding mathematical ability, and arithmetic skills to anxiety in mathematical situations and to performance in the first semester course in basic statistics.

The sample consisted of 92 adults, 16 male and 76 female, who were registered for the first semester course in basic statistics in the School of Education, Health, Nursing and Arts Professions at New York University. Participants were asked to fill out the Beliefs About Mathematics Scale and the Mathematical Self-Concept Scale, developed for this study, the Mathematics Anxiety Rating Scale, and the Arithmetic Skills Test during the last half hour of their first class session of the semester. Approximately eight weeks after the beginning of the semester, participants were given a midterm examination; a portion of this examination was constructed and scored by the reseacher.

Hypotheses 1 stated that there would be a positive linear relationship between mathematics anxiety and beliefs about mathematics. This hypothesis was supported, and a low to moderate relationship was found.

Hypothesis 2 stated that there would be a negative linear relationship between mathematics anxiety and mathematical self-concept. This hypothesis was supported, and a moderate to strong relationship was found.

Hypothesis 3a stated that the combination of beliefs about mathematics and mathematical self-concept would account for a portion of the variance in mathematics anxiety. This hypothesis was supported, and it was found that mathematical self-concept was the only predictor to contribute significantly to the regression.

Hypothesis 3b stated that the combination of beliefs about mathematics, mathematical self-concept, and arithmetic skills would account for a portion of the variance in mathematics anxiety. As stated, this hypothesis was supported; however, it was found that the addition of arithmetic skills to the regression did not improve prediction significantly.

Hypothesis 4 stated that the combination of beliefs about mathematics, mathematical self-concept, and arithmetic skills would account for a portion of the variance in performance in basic statistics. This hypothesis was supported; however, it was found that arithmetic skills was the only significant predictor.

Hypothesis 5 stated that the combination of beliefs about mathematics and mathematical self-concept would discriminate among groups of basic statistics students with respect to level of mathematics anxiety and level of course performance. This hypothesis was supported: one discriminant function, in which mathematical self-concept played the primary role, was found significant, and students could be classified into the four possible anxiety-performance groups with 57% accuracy. It was also found that students' mathematical self-concept corresponded more closely to their level of mathematics anxiety than to their level of performance.

Additional analyses showed that performance in arithmetic skills was substantially related to both beliefs about mathematics and mathematical self-concept, that students high in mathematics anxiety and low in mathematical self-concept tended to give up more easily in response to the Arithmetic Skills Test, that mathematics anxiety tended to be more debilitating for the older student, and that students who withdrew from the corse tended to score relatively high on erroneous beliefs about mathematics.

### INSTRUCTIONAL USE OF MICROCOMPUTERS IN INDIANA PUBLIC HIGH SCHOOLS Order No. DA8322551

Green, Gussie Lee, Ed.D. *Ball State University*, 1983. 255pp.
Chairman: Dr. Frank T. [illegible]aser

The purpose of the study was to identify the use of microcomputers for student instruction in Indiana public high schools. An additional purpose was to identify the number and brand of microcomputers in Indiana public high schools. To accomplish the purposes, 363 public high school principals were requested to give questionnaires to eleven department chairpersons. Questionnaires were returned by 282, 78 percent, of the principals. Data were tabulated for raw scores and percentages.

*Findings.* (1) Microcomputers were used in 84 percent of Indiana public high schools. (2) APPLEs or TRS-80s constituted 71 percent of 2332 microcomputers located in 286 high schools. (3) Students in 2 percent of the art departments used microcomputers for problem solving, programming, simulation, and tutorial. (4) Students in 40 percent of the business departments used microcomputers for computer literacy, drill and practice, games, problem solving, programming, simulation, tutorial, and word processing. (5) Students in 9 percent of the English departments used microcomputers for computer literacy, drill and practice, games, problem solving, programming, tutorial, and word processing. (6) Students in 7 percent of the foreign language departments used microcomputers for computer literacy, drill and practice, games, problem solving, programming, simulation, and tutorial. (7) Students in 2 percent of the home economics departments used microcomputers for computer literacy, drill and practice, games, problem solving, and simulation. (8) Students in [illegible] percent of the industrial arts departments used microcomputers for computer literacy, drill and practice, games, problem solving programming, repair and maintenance, simulation, and tutorial. (9) Students in 62 percent of the mathematics departments used microcomputers for computer literacy, drill and practice, games, problem solving, programming, simulation, and tutorial. (10) Students in 3 percent of the music departments used microcomputers for drill and practice, games, problem solving, programming, and tutorial. (11) Microcomputers were not used in the physical education departments. (12) Students in 30 percent of the science departments used microcomputers for computer literacy, drill and practice, games, problem solving, programming, simulation, and tutorial. (13) Students in 5 percent of the social studies departments used microcomputers for drill and practice, games, problem solving, programming, simulation, and tutorial.

## THE EFFECT OF TEACHER SIGNALS, GROUP PARTICIPATION, AND ERROR CORRECTION PROCEDURES ON STUDENTS' VERBAL MATH RESPONSES

**Order No. DA8303892**

GRINSTEAD, JOE DALE, PH.D. *University of Kansas*, 1982. 120pp.

The effect of a group participation procedure, signals to respond, error correction, and a warm up game on student's verbal academic responding during mathematics instruction was investigated within a multiple baseline design across classrooms. Student response to individual and group questions, student participation during group questions, and student response to the teachers' error correction procedures were recorded for the students in one third and two fourth grade classrooms. Teacher and student interactions during instruction were recorded by an observational system enabling sequential coding of these interactions. The results indicated increased student participation on group questions and decreased incorrect responding on questions directed to individuals. In addition, the probability of a correct student response occurring after an error was found to be differentially sensitive to the error correction strategies used by the teacher. The strategies that were more likely to occasion a correct response were those in which the teacher told the individual/group the correct answer.

## THE EFFECTS OF NONPROMOTION ON FIRST THROUGH FOURTH GRADE STUDENTS AS RELATED TO ACADEMIC ACHIEVEMENT, SELF-CONCEPT AND INTELLECTUAL MATURITY

**Order No. DA8319235**

GUTIERREZ, MYRTLE LEE, ED.D. *Northern Arizona University*, 1983. 103pp. Adviser: Robert F. Boothe

The purpose of this study is to analyze the effects of nonpromotion of students in grades one through four at Littleton Elementary School on academic achievement in reading and mathematics, student self-concept and intellectual maturity. Littleton Elementary School District, located on the southwest side of Phoenix, Arizona, has an ethnic makeup of 65 percent Mexican-American, 34 percent white and 1 percent black, Indian and other races. Migrant students comprise 25 percent of the district's population.

The 1981-82 study involved 358 students in grades one through four. Included were 96 first grade students, 97 second grade students, 56 third grade students and 109 fourth grade students. Eight-one (21 percent) of the 358 students had not been promoted at the end of the 1981-82 school year. The experimental group included the nonpromoted students in each of the four grade levels. All students in the four grades whose classroom contained a nonpromoted student were pretested and posttested with the Martinek-Zaichkowsky Self-Concept Scale; the California Achievement Test - Form C, Reading and Mathematic Section; and the Short Form Test of Academic Aptitude. Comparisons were made of mean gain scores of the promoted and nonpromoted groups using the statistical application of the t-test of significance at the .05 level. The null hypothesis was that no significant difference existed between the promoted and nonpromoted groups for self-concept, reading and mathematic achievement, and intellectual maturity.

The research findings indicate that, (1) *Academic Achievement*--Second, third and fourth grade nonpromoted students showed a significant gain in reading and mathematics; (2) *Self-Concept*--No significant difference was found between promoted and nonpromoted groups in mean gain scores on the total Self-Concept Scale for all grades. (3) *Intellectual Maturity*--No significant difference was found between the second, third and fourth grade promoted and nonpromoted groups in the mean gain scores on the Short Form Test of Academic Achievement.

## BRIEF COUNSELING INTERVENTION IN COLLEGE ALGEBRA

**Order No. DA8310116**

HAINES, JAMES MILLS, PH.D. *Kansas State University*, 1982. 253pp.

The purpose of this study was to investigate the effects of brief group counseling with regards to changes in locus of control and/or level of mathematics anxiety. The instruments used to measure each of these pre- to post-test changes were the Rotter Internal-External Control Scale (1966) and the 40-item math anxiety scale recommended by Richardson and Woolfolk (1980).

The subjects were enrolled in college algebra at a major mid-western landgrant university during an eight-week summer session. The enrollment in the experimental and control classes was 91 and 63 respectively. Due to the nature of the statistical analysis and missing data, the sample size varied.

The brief group counseling focused on the self-limiting beliefs which may restrict people from realizing their full mathematical potential. Handouts were accompanied by three to five minute expansion of the points. The content of these sessions exposed several myths and irrational beliefs related not only to mathematics but life in general.

The data was analyzed in a three-way classification utilizing the general linear models procedure at the 0.05 alpha level. For significant F-ratios the least means were computed and separated using Fisher's LSD.

The only combination which produced a significant statistical finding utilizing the I-E change score as the dependent variable was Group x Age. With math anxiety change scores as the dependent variable, the following independent variables were involved in significant two- or three-way combinations; group, sex, year in college, minimum grade needed, final grade and reason for taking the course. The independent variables, final grade and level of math anxiety (on the pretest), also resulted in a significant analysis with the dependent variable being the math anxiety change score. However, other variables failed to produce any significant results. These included major, last math course, number of years since the last math course, birth order, grade expected, and perceived chances of failing.

## THE RELATION OF SOCIOECONOMIC AND SCHOLASTIC APTITUDE VARIANTS TO ACADEMIC ACHIEVEMENT FOR MALES AND FEMALES AT THIRD AND FIFTH GRADES

**Order No. DA8307749**

HALDERMAN, BARRETT G., PH.D. *Iowa State University*, 1982. 230pp. Supervisor: Gary D. Phye

To determine the relation of socioeconomic and scholastic aptitude variants to academic achievement, data were collected from 332 elementary students in a small midwestern city. Independent variables included group aptitude test scores from third grade and fifth grade administrations, sex of subjects, family socioeconomic status (SES) based on parental occupation, and school of attendance (Title I versus Nontitle I). Dependent variables included group achievement test scores from third and fifth grade administrations and teacher grades for Reading and Math at fifth grade. Group aptitude indices included total aptitude scores and the difference between verbal and nonverbal aptitude scores. The study was designed to examine: (a) whether achievement patterns were the same for males and females when different levels of SES, total aptitude, and differences between verbal and nonverbal aptitude were considered; (b) whether similar results would be found at third and fifth grades and across various achievement measures (i.e., achievement subtests and teacher grades at fifth grade; and (c) whether SES distinctions based on family characteristics versus more general sociological characteristics (i.e., school of attendance) provided similar information about a student's probable level of academic achievement. In general, the data support achievement differences between males and females based on the interaction between total aptitude and verbal-nonverbal discrepancies. The contrast between high verbal and high nonverbal students was most pronounced for females with low to average total aptitude scores at third grade and for low total aptitude females again at fifth grade. A moderate degree of similarity was found between third and fifth grade results. Little similarity was found between achievement test performance and teacher grades at fifth grade. The variables of SES, total aptitude, and difference score accounted for approximately twice the variance in Reading Total and Math Total as in Reading Grade and Math Grade. The measurement of achievement based on SES and school were similar; with total aptitude partialled out, there was a differential effect by sex. Females were more sensitive to quality of school while males were more sensitive to quality of home.

## COMPARISON OF MATHEMATICAL ACHIEVEMENT OF PSYCHOTIC CHILDREN AND EMOTIONALLY DISTURBED NONPSYCHOTIC CHILDREN Order No. DA8311174

**Hammer, Marlene Breger**, Ph.D. *Duke University*, 1982. 107pp.
Supervisor: Lucy T. Davis

The purpose of the research was to investigate relationships between measures of mathematical achievement of psychotic children compared to measures of mathematical achievement of emotionally disturbed nonpsychotic children receiving treatment for psychiatric conditions in a residential facility. The researcher sought to determine if a discrepancy in standardized reading and mathematics achievement test scores, suggesting deficits in mathematical ability, occurred more frequently in the performance of children diagnosed as psychotic. In addition, scores from reading and mathematics subtests attained on achievement tests were examined as a possible way of determining if selected subjects in a residential treatment facility could be hypothetically classified as psychotic or nonpsychotic on the basis of their performance on any given subtest or composite of subtests. The Metropolitan Achievement Test (MAT) (1970) was used for measures of reading and mathematical achievement.

The subjects were 30 psychotic and 30 nonpsychotic inpatients between 8.0 and 11.0 years of age who were admitted to the Children's Psychiatric Institute, North Carolina (CPI) between 1970 and 1977. All subjects were white, middle socioeconomic status males or females with at least average range intelligence. Each of the subjects had been diagnosed by an interdisciplinary diagnostic team at the CPI.

MAT total reading and mathematics scores were converted to standard scores to ensure comparability. Mathematics scores were subtracted from reading scores to obtain discrepancies between the two, and the *t* test was used to test the significance of mean discrepancies attained for the psychotic and the nonpsychotic groups. Analysis of variance was used to determine if the sex of the subjects was a factor affecting the results. Discriminant analysis was used to determine whether subjects could be classified hypothetically as psychotic or nonpsychotic on the basis of their MAT subtest scores.

The researcher concluded that psychotic subjects in this study had significantly discrepant performances in reading and mathematics, suggesting deficits in mathematics that were not evident in the performance of the emotionally disturbed nonpsychotic subjects. On the basis of two MAT subtest scores, Mathematics Computation and Reading Comprehension, 68% of the subjects included in the research were correctly classified as psychotic or nonpsychotic.

## REDUCTION OF MATHEMATICS ANXIETY IN COLLEGE REMEDIAL ALGEBRA STUDENTS Order No. DA8313297

**Handler, Barbara Hershey**, Ed.D. *The University of Tennessee*, 1982. 149pp. Major Professor: Dr. Donald Dessart

Debilitating anxiety in mathematics has been recognized as a student problem for many years. Recently researchers have taken a closer look at the problem of mathematics anxiety in order to formulate treatments and, ultimately, prevention of the problem. It was the purpose of this study to investigate the following two general hypotheses: (1) There is an inverse relationship between anxiety and competency in mathematics. (2) A decrease in mathematics anxiety can be brought about by a combination of mathematical and nonmathematical treatments.

Students involved in this project included 37 Freshmen students at Maryville College, Maryville, Tennessee, Fall, 1981. These students successfully answered less than nine questions on the Mathematics Placement Examination (MPE). Eleven students not being required to enroll in mathematics formed the Control Group. The remaining 26 students were placed in either the Instruction (15 students) or Instruction with Anxiety Reduction Treatment (11 students) Group. Both of these groups met four times per week for mathematics instruction. Members of the Instruction and the Instruction Anxiety Groups received their mathematics instruction in one of two classes taught by the same instructor. The Instruction Anxiety Group also met weekly with a counselor who led the group in mathematics anxiety reduction techniques.

For all three sections, the Mathematics Anxiety Rating Scale (MARS) was given as both a pre- and posttest. All students also took the Mathematics Placement Examination (MPE) as a posttest.

Within the three treatment groups, students were placed in the high, medium or low anxiety range according to their pretest MARS score. This division resulted in small groups and, thus, the results of various inferential statistical methods could not be utilized.

The first general hypothesis of the project was not supported statistically. All students in the Instruction Anxiety Group, however, did experience a decrease in mathematics anxiety, as measured by the MARS, and an increase in mathematics competency, as measured by the MPE.

The average final mathematics course grade for the Instruction Anxiety Group was one letter grade above the average final mathematics course grade for the Instruction Group. The conclusions of the study supported the second general hypothesis.

## AN INVESTIGATION OF THE AFFECTIVE AND COGNITIVE EFFECTS OF THE TEACHER-DIRECTED CONVENTIONAL METHOD, THE STUDENT-DIRECTED INDIVIDUALIZED METHOD, AND THE STUDENT-DIRECTED COMPETENCY-BASED METHOD OF INSTRUCTION IN SECONDARY BUSINESS MATHEMATICS CLASSES Order No. DA8227982

**Harsher, Sharon Lee**, Ph.D. *University of Maryland*, 1982. 389pp.
Supervisor: Robert M. Peters

The purposes of this investigation were to compare the cognitive achievement, cognitive retention, and attitude toward subject matter of secondary business math students taught by the teacher-directed conventional method, the student-directed individualized method, and the student-directed competency-based method of instruction. Differential affective and cognitive effects were also compared in terms of teacher bias toward instructional method.

Dependent variables were achievement, measured by an 86-item cognitive test; retention, measured by an 86-item cognitive test; and attitude, measured by a Purdue attitude scale, A Scale to Measure attitude Toward Any School subject.

Affective and cognitive premeasures served as covariables. Both the achievement pretest and the achievement posttest served as covariables in the analysis of retention results.

Thirty-two classes in seventeen high schools in Baltimore County, Maryland, participated. Students in the individualized and competency-based groups received self-instructional packages. Unlike the competency-based packages, the individualized packages did not include goal-related components.

Analysis of covariance conducted on achievement yielded no significant differential effects among treatment groups.

As heterogeneity of group regression lines rendered the analysis of covariance inappropriate for the retention and attitude variables, Johnson-Neyman solutions were conducted to locate regions of significance on those variables between pairs of treatment groups.

along specified ranges of the covariable(s).

The Johnson-Neyman solutions, which located some regions of significance, suggested the following: (1) For some students, self-directed instruction that includes goal-related information appears to elicit superior retention results as compared with self-directed instruction that does not include goal-related information. (2) For some students, positive teacher bias with regard to instructional method appears to favorably influence retention. (3) For some students, self-directed instruction appears to be superior to teacher-directed instruction in eliciting favorable attitudes. (4) For some students, positive teacher bias with regard to instructional method appears to favorably influence student attitudes. (5) For some students, self-directed instruction that does not incorporate goal-related information appears to elicit more favorable attitudes than does self-directed instruction that does include this information.

### SECONDARY ALGEBRA TEXTBOOKS IN THE UNITED STATES 1806-1982: SELECTED DESCRIPTIONS AND HISTORICAL TRENDS

Order No. DA8227661

**Hartzler, Stanley James**, Ph.D. *The University of Texas at Austin*, 1982. 204pp. Supervisor: Ralph W. Cain

The purpose of the study was to identify and classify time-specific objectives in secondary algebra textbooks published in the United States; to investigate possible historical trends in exercise variables; and to determine effects of professional opinion and research upon exercise content and arrangement.

To accomplish this purpose, a sample of 138 algebra textbooks of copyright date 1806 to 1982 (inclusive) was selected from an available sample of 600 such textbooks. This sample was stratified into seven time periods and included 91 two-year courses in one or two volumes. A 900-title secondary algebra textbook bibliography was compiled as a check on the sample. A preliminary index of 400 objectives was developed from 12 of the 600 books, and forms were designed to record sequence, chapter and section location, objective identification code, and quantity for each objective found. Approximately 42,000 identifications were made for 435,006 problems and 1,900 different objective descriptions.

These data were keypunched and processed using FORTRAN programs and were analyzed by simple analysis of variance to answer nine questions related to historical trends in exercise variables. Data pertaining to student exercises were examined with respect to issues generated by research findings and journal articles, to test for author-publisher responsiveness to these findings and opinions. The number of one-appearance objectives from the past 25 years was compared with that of other periods.

The study found significant historical trends ($p < .05$) in total numbers of (a) problems, (b) objectives, (c) unique objectives, and (d) sections, and in ratios of (e) problems per objective, (f) objectives per section, (g) problems per section, (h) reviewed objectives to objectives, and (i) sorted word problems to word problems. The past 25 years was found to be a period of unusually frequent one-appearance objectives. The past five years of publishing were found to be unique in several ways. Evidence was found of lack of author-publisher response to criticism and research.

### VARIATIONS ON DIRECT INSTRUCTION IN ONE THIRD GRADE CLASSROOM

Order No. DA8307164

**Harvey, Patricia Cooper**, Ph.D. *Stanford University*, 1983. 327pp.

*Purpose of the Research.* The purpose of this study was to provide a concurrent, small-scale replication of the Crawford et al. (1978) experiment testing the effects on student reading achievement of a structured teaching model and a parent-assisted learning skills program. Due to the relatively poor treatment implementation among some of Crawford et al.'s teachers, and a high attrition rate in the parent program, an in-depth study of treatment provided better understanding of factors affecting treatment implementation.

*Methods and Procedures.* The treatment group--the investigator's third grade class--was systematically administered the experimental treatments while five other third grade classes in the investigator's school district served as no-treatment control classes. The implementation process was explored in the treatment group using videotapes, an autobiographical description of events at each of three levels of implementation, interviews with frequent classroom participants, and high-inference observations and educational criticism by Stanford-trained observers. Treatment effects were assessed by comparing achievement scores (reading, language, and mathematics) and attendance records from grade 2 to achievement scores and attendance records from grade 3.

*Results and Conclusions.* Analyses of covariance performed on mathematics outcome scores revealed significant differences ($F = 3.768$; $p = .026$) between groups favoring the investigator's class, a result similar to that of Crawford et al. on mathematics achievement. Aptitude-treatment interactions were found for the other achievement outcomes and days absent, indicating that treatments favored higher ability students and hindered the performance of lower ability students. Corno (1980) reported similar effects on reading achievement and vocabulary. Concerning absenteeism, the treatment appeared to encourage improvement in third grade attendance records of those with better grade 2 attendance, while tending to worsen the grade 3 attendance records of those with poorer grade 2 attendance. A significant correlation ($r = .73$; $p < .001$) was found between LSP completion and the LSP concept acquisition test score, suggesting that the LSP was highly successful in teaching students to discern teacher structuring and student participatory behavior.

Evidence from this study appears to support the utility of the treatment used for increasing elementary mathematics achievement, but suggests a need for additional research on alternative instructional methods to enhance the elementary reading and language achievement of all students.

### DEGREES OF LATERALITY, MASKING, AND THE LOCUS FOR THE EMERGENCE OF HEMISPHERIC ASYMMETRIES IN SPATIAL COGNITION

Order No. DA8308430

**Hass, Edward Joseph**, Ph.D. *Rutgers University The State U. of New Jersey (New Brunswick)*, 1983. 118pp. Director: Professor Mark W. Altom

The hypothesis that spatial skills are more strongly represented in the right cerebral hemisphere than the left hemisphere was tested in a series of experiments that employed a mental rotation task. Subjects had to decide whether stimuli presented to the left visual field-right hemisphere or the right visual field-left hemisphere appeared in the same or mirror version of a standard when the test stimuli had been rotated through various angles. When Arabic numerals were employed, no visual field asymmetries resulted (Experiment 1). When unfamiliar nonsense figures were employed as stimuli, the data suggested that the ability to mentally rotate the stimuli was more strongly represented in the right hemisphere than in the left hemisphere, although the ability was present in both hemispheres (Experiment 2). A visual mask was employed in Experiment 3 to interfere with processing in both hemispheres. An accentuated left visual field advantage was obtained, supporting the conclusion that the ability to perform mental rotation was more strongly represented in the right hemisphere.

The mask had the potential of operating either at the peripheral or central processing level. In Experiment 4 a mask that could only operate at the central level was employed, and yielded results similar to those in Experiment 3. This suggested that the functional locus for the asymmetrical interference was in the central visual system, implying that hemisphere asymmetries arise at that level. In Experiment 5, four masking conditions were employed as within-subject conditions to allow within-experiment comparisons of the four masks. The results suggested that a right hemisphere superiority exists at the central level, but that a left hemisphere superiority exists at the peripheral level. The results of all five experiments are interpreted as supportive of a "cooperation model" of hemispheric asymmetries, in which the two hemispheres act as complementary processors to divide up cognitive demands most efficiently.

### THE RELATIONSHIP OF CERTIFICATION AND MATHEMATICS BACKGROUND OF TEACHERS AND PUPIL PERFORMANCE ON THE NCCT-M AFTER REMEDIATION

Order No. DA8315641

**Hathaway, Harriet Anne**, Ed.D. *The University of North Carolina at Greensboro*, 1983. 143pp. Director: Dr. Dale Brubaker

The purpose of this study was to investigate within the Secondary Remediation Programs in Southeastern North Çarolina the relationship between pupil performance on the mathematics portion of the *North Çarolina Competency Test* after remediation and each of four teacher variables--subject level of certification, grade level of certification, predominant type of mathematics studied, and number of semester hours of mathematics formally studied after high school.

Data were obtained for 498 nonhandicapped eleventh-grade pupils and 16 teachers in 16 public high schools in Southeastern North Carolina for the two-year period, 1979-81. Teacher variable data were obtained through questionnaire. Pupil scores on the *North Carolina Competency Test - Mathematics* (NCCT-M) were procured through the Division of Research, North Carolina Department of Public Instruction.

For each of the school years, 1979-80, 1980-81, and the two-year period, 1979-81, the relationship between each of the four teacher variables and the numbers of pupils having score gains below and score gains equal to or above the mean gain and the numbers of pupils passing and failing the NCCT-M was tested using chi square. A significance level of .05 was used for all tests.

The findings suggested that of the four teacher variables, only number of semester hours of mathematics formally studied by the teacher made a significant difference in pupil performance on the NCCT-M. An analysis of the data reflected the tendency of teachers studying 21-36 hours to have (1) the largest proportion of pupils exhibiting score gains equal to or above the mean gain and (2) the largest proportion of pupils passing the NCCT-M after remediation.

It was concluded that the mathematics background of the teacher is of importance when that teacher provides instruction in secondary remedial mathematics. Therefore, this variable should be a factor when employing teachers not certified in secondary mathematics to teach secondary remedial mathematics. Suggestions were made for further study on a state-wide scale, using combinations of many different teacher variables, and using different random samples of teachers, including teachers of 7th grade mathematics, 8th grade mathematics, and General Mathematics.

## FACTORS OF ORGANIZATION AND CLARITY IN MATHEMATICS LESSONS

Order No. DA8301223

**Hativa, Nira Brenner**, Ph.D. *Stanford University*, 1982. 171pp.

*Purpose.* Good organization and clarity of oral messages has been found to improve listeners' understanding and retention by researchers in education, psychology, and communication. The objectives of this study were to investigate high- medium- and low-inference factors in mathematics teachers' messages that make lessons organized and clear, to determine which teacher strategies discriminate between teachers rated by their students high or low on lesson organization and clarity, and to explore relations of teacher motivation, experience, and general scholastic ability to lesson organization and clarity.

*Procedure.* All graduate mathematics students at Stanford university who teach mathematics in undergraduate courses were rated by their students on lesson organization and clarity. A well organized and clear lesson was defined as a lesson that is easy to follow, understand, and remember. Eight of these teachers who were rated either very high or very low formed two groups of subjects. Two lessons of each subject were tape-recorded and transcribed. GRE scores were obtained. Using the lesson transcriptions, about 50 strategies have been identified as medum- and low-inference factors of lesson organization and clarity. An experienced mathematics teacher scored each transcribed lesson on 38 of these factors. Another experienced mathematics teacher scored only two lessons--one of a high-rated teacher and one of a low-rated teacher.

*Findings and Conclusions.* Using t-Tests, significant ($p < .05$) differences between the two groups of teachers were obtained on 18 of the measured variables. Teachers' lesson organization and clarity was found to be independent of teachers' general scholastic ability, to be only moderately related to their motivation or experience, and to be consistent over time and classes.

The findings of this study may serve to train mathematics teachers at the high school and college level to improve their instruction, and to form a basis for research in several areas. Results may be generalizable to written messages, other subject-matters (especially sciences), and teaching in other school levels and settings.

## THE DEVELOPMENT AND EVALUATION OF A MICROCOMPUTER-BASED MATH ASSESSMENT AND REMEDIATION PROGRAM FOR MILDLY-MENTALLY HANDICAPPED JUNIOR HIGH SCHOOL STUDENTS

Order No. DA8317165

**Haus, George James**, Ph.D. *Indiana University*, 1983. 207pp.

This study evaluated the effectiveness of a microcomputer-based math assessment and remediation instructional package. Current theoretical thinking in computer-based instructional programming was used as a basis for the design of the package. Two learning paradigms, free and controlled operant, were used as formats for presentation of instructional stimuli. Carr's (1960) summary of work by Skinner (1954) and Gilbert (1958) was also used to guide the design of the package. The program included initial assessment and individualized placement. Ongoing assessment and error analysis determined student progress through hierarchically-arranged instructional content. Frequent immediate and summative feedback were presented to the students. Individuals could proceed at their own pace.

Subjects were mildly mentally handicapped junior high school students, who scored three to five years below grade level in basic math computation skills. Subjects spent five minutes per day in instruction presented by the computer. They were exposed to a total of four weeks of instruction, and four weeks of baseline data collection (100 total minutes of instruction) in an A-B(1)-A-B(2)-A design. Student placement in two out of four possible math operation areas (addition, subtraction, division, and multiplication) was determined by initial assessment.

Data were analyzed individually in terms of progress on computer-administered criterion-referenced tests. All but two of the subjects demonstrated marked gains in the areas of math remediation individualized for their specific skill deficit areas. These data were discussed in terms of their implications for future research in computer-based instruction.

## RELATIONSHIPS BETWEEN ELEMENTARY TEACHERS' EXPRESSED ATTITUDES TOWARD STUDENTS, QUALITY OF DYADIC CLASSROOM INTERACTION AND STUDENT GRADES

Order No. DA8300157

**Hazlett, Benjamin Addison**, Ed.D. *Oklahoma State University*, 1982. 48pp.

*Scope of Study.* This study focuses on dyadic interaction in selected elementary school classrooms, the quality of the interaction that takes place between a teacher and selected students and the level of academic achievement of those selected students. The study hypothesizes that there are significant relationships between a teacher's expressed attitude toward students, the quality of dyadic interaction that takes place within the classroom and the academic achievement of the selected students. The relationships of these variables were studied on a sample consisting of six elementary school teachers and 36 fifth and sixth grade students in a northeastern Oklahoma community.

Chi-square and contingency coefficients were computed to test for relationships of the hypotheses. Chi-square and contingency coefficients were also used to test the relationships between the race of the students and the quality of dyadic interaction.

*Findings and Conclusions.* Significant relationships were found to exist in the relationship between: (1) the teachers' expressed attitudes toward students and the quality of the dyadic classroom interaction, (2) the teachers' expressed attitudes toward students and academic achievement as measured by mathematics grades and (3) the quality of dyadic classroom interaction and the students' academic achievement as measured by students' grades. Also, a significant relationship was found to exist between the race of the student and the quality of the dyadic classroom interaction.

### FACULTY DEVELOPMENT STRATEGIES FOR IMPROVING MATHEMATICS INSTRUCTION IN INTERMEDIATE ELEMENTARY GRADES Order No. DA8306442

HEIDENREICH, BOYCE HUGHETT, ED.D. *Seattle University*, 1982. 254pp. Supervisor: Gary H. Zarter

Taking into consideration the problems associated with inservice education and the characteristics of successful staff development programs most frequently mentioned in the literature, it was the purpose of this study to plan, implement, and evaluate a model inservice program in mathematics designed to meet the needs of both students and teachers.

Based on a review of the literature, it was hoped the model program would provide teachers with materials, activities, and instructional techniques which would prove to be useful to them in working with their students. It also was hoped this model would be effective in raising the achievement test scores of students in grades 4, 5, and 6 in those areas of intermediate mathematics where the need for improvement had been identified.

The effectiveness of the model was tested by making a variety of comparisons between a mathematics inservice group and a control group. The hypothesis which was considered was that students of those intermediate elementary teachers who had participated in a series of mathematics inservice workshops would receive significantly higher scores on a mathematics achievement posttest than students whose teachers had not participated in the workshops.

Each of the evaluation instruments used in this study confirmed the success of the inservice program in meeting the needs of the teachers who participated in the workshops as well as their students. The structure of the workshop sessions, the planning and implementation strategies used to ensure the participation of those who enrolled in the workshops, and the variety of materials, activities, and teaching techniques shared with the participants contributed to the success of the program. In addition to the increase the teachers reported in their own competence and personal enjoyment in working with mathematics, there was a statistically significant increase in the achievement scores of those students whose teachers had participated in the workshop sessions.

It is believed that the staff development program described in this study could be useful to other districts in planning, implementing, and evaluating faculty development programs in a variety of academic content areas.

### AN EXPLORATION OF THE EFFECT OF STRUCTURE VARIABLES ON MATHEMATICAL WORD PROBLEM-SOLVING ACHIEVEMENT Order No. DA8313444

HELLER, LUCILLE CECILIA, ED.D. *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 167pp. Chairperson: Carolyn A. Maher

In response to the prevalent concern among educators about inadequate mathematical problem-solving abilities, an exploration of relationships among three measures for assessing cognitive structures and success on a mathematical word problem-solving test was undertaken. According to Piaget and Bruner, acquisition of certain schemes relating to concept attainment is crucial to mathematics understanding. Two tasks designed to assess such schemes--an understanding of the properties of a mathematical group and proportional logic--were administered clinically to 113 students. Field independence, a cognitive style previously linked strongly with successful problem solving, was the third structure variable.

The findings of this study are consistent with the expectation that students would be more successful on a standardized mathematical problem solving test if they were rated at the high level on one or more of the structure variables. Students rated as field independent had four times the odds in favor of successful problem solving than field dependent students; those manifesting an understanding of the group properties had three times the odds in favor of success compared with those who did not, and students rated formal in proportional reasoning had 2.2 times the odds of those at the nonformal level. The chances for success improved for students rated at the high level on any two measures and, for those rated high on all three, the odds in favor of success were 26.4 times those at the low level on all three.

Furthermore, these measures were found to be independent, suggesting that a high rating on one variable did not imply that a student would be rated high on another.

An analysis of individual problems indicated that success was frequently related to the presence of one or more of the three structure variables, particularly when the variable was isomorphic to the mathematical structure of the problem. Performance on a given problem improved with corresponding high ratings on two or three structure variables. The greatest probability of success was associated with high ratings on all three.

### EVALUATION OF THE PLACEMENT TEST FOR FIRST-YEAR MATHEMATICS AT THE UNIVERSITY OF AKRON Order No. DA8314828

HELMICK, FAITH ILLEEN, PH.D. *The University of Akron*, 1983. 168pp.

The purpose of this study was to develop a possible methodology that could assist institutions of higher education to evaluate the effectiveness of mathematics placement programs. The problem involved both a systematic investigation of the capability of selected variables to predict the academic performance of entering freshmen in specific mathematics courses and the development of a prediction model based on these variables useable by instructors and advisers to place students in appropriate courses. The study was conducted at The University of Akron, Akron, Ohio.

This *ex post facto* study included 795 students who had entered The University of Akron Fall Semester, 1981, taken the Mathematics Placement Test and completed the course "3450:111 Algebra." The general statistical technique used to analyze the data was multiple linear stepwise regression.

Of the eight variables included in the study, the score on the Mathematics Placement Test, the overall high school grade point average, and the ACT mathematics score were selected for the final prediction model. These variables accounted for 44% of the variance in the college algebra grade. In a second procedure which included students who were designated as low achievers on college entrance examinations, the Mathematics Placement Test score, the ACT composite score, and the number of semesters of high school mathematics completed were selected for the prediction model. This model accounted for 48% of the variance in the college algebra grade. No significant difference in the predictive ability of the model was found when sex, membership in a minority group, attendance in high school advanced placement mathematics, or attendance in different length algebra instructional periods were included in the analysis. There was a significant difference in the predictive ability of the model for students who had completed elementary algebra prior to algebra.

The study concluded that the institutionally designed Mathematics Placement Test was an appropriate and easily useable predictor of academic performance in college algebra and that mandatory testing and placement of freshmen should be considered. Programs for improvement of mathematical skills at the high school level were also discussed and recommended.

### A LONGITUDINAL ANALYSIS OF COLLEGE-WIDE AND MAJOR FIELD GRADING STANDARDS Order No. DA8226897

HENRY, DOLPHUS EUGENE, III, PH.D. *Virginia Polytechnic Institute and State University*, 1982. 127pp.

This study investigates whether national trends of declining SAT scores and grade inflation were evident at a small liberal arts college. Specifically, the changes in grading standards between major fields and across time periods were examined against the model of Adaptation-Level grading. (The Adaptation-Level grading theory hypothesizes a positive relationship between ability levels and grading standards.) Actual total and major GPA's were regressed separately on the SAT-verbal scores, SAT-math scores, and secondary school class ranks. The resulting regression equations were used to project a hypothetical GPA when applied to the predictor data of other major fields or longitudinal cohort groups.

Evidence of Adaptation-Level grading was found between major GPA's of the major fields in the first two of three cohort groups. However, only the grading of the second cohort was significant at the .05 level. Between each cohort, the relative grading standards of the general academic areas (humanities, social sciences and sciences) remained relatively stable. The standards between the individual major fields in each area were less so. Adaptation-Level grading was also found for each of three total GPA performance levels across time periods with the highest GPA level exhibiting the greatest drop in grading standards over time. No consistent major GPA grading pattern was found between the individual major fields across time periods.

Since Adaptation-Level grading was found between cohort groups for the total GPA's and not for the major GPA's, it was concluded that the grading pattern of total GPA's was primarily due to the grading patterns of lower level or service courses.

## THE VALIDITY OF THE DEVELOPING COGNITIVE ABILITIES TEST: IMPLICATIONS FOR TEST INTERPRETATION

Order No. DA8229275

Henry, Paul, Ph.D. *Southern Illinois University at Carbondale*, 1982. 232pp. Major Professor: Dr. Harold R. Bardo

The purpose of this study was to investigate the construct and predictive validity of the Developing Cognitive Abilities Test (DCAT), a new taxonomy-type scholastic aptitude test. In addition, a model for reporting and interpretating DCAT results was presented. A total of 7,007 students enrolled in randomly selected school districts were the subjects. Students took the DCAT and the Achievement Series test during the 1979-80 school year. The DCAT yields scores on eight subtests across two dimensions: (1) Content dimension: Verbal, Quantitative, and Spatial; (2) Cognitive dimension: Knowledge, Comprehension, Application, Analysis and Synthesis. The Achievement Series tests utilized were: Reading, Language, and Mathematics. The data were compiled and analyzed in the following manner: (1) The percent of correct items were calculated for each DCAT subtest (Cognitive dimension) for each grade group tested. (2) Correlations among the DCAT subtests (cognitive dimension) were calculated and ordered in a 5 x 5 intercorrelation matrix for each grade group tested. (3) Correlations were calculated between the eight subtests of the DCAT and the three Achievement Series subtests for each grade group. (4) Multiple Regression Analysis was used to examine the unique contribution of each DCAT subtest to the variance of each Achievement Series subtest.

The results are as follows: (1) The percentage of correct items in two of the six grade groups tested totally supported the hypothesized cumulative hierarchical structure on the DCAT; (2) of the 48 possible correlations examined, 32, or 66 percent, yielded the hypothesized structure. The hypothsized structure was upheld in four of the six grade groups tested; (3) the correlations revealed that there was a relationship between DCAT subtests and subtest of the Achievement Series. The results showed that all correlations were significant (.01 level) across all grade groups tested; (4) in general, the results of multiple regression analysis revealed that each of the DCAT subtests made a significant (.01 level) contribution to the variance of each Achievement Series subtest across all grade groups tested. The only exception observed was the DCAT Synthesis subtest which failed (more often than not) to make a significant contribution. It was concluded that the DCAT possesses both construct and predictive validity.

## THE EFFECTS OF A PROBLEM SOLVING ORIENTED MATHEMATICS PROGRAM ON GIFTED FIFTH-GRADE STUDENTS

Order No. DA8323998

Hersberger, James Russell, Ph.D. *Purdue University*, 1983. 227pp. Major Professor: Grayson Wheatley

The purpose of the investigation was to determine the effects of a problem solving oriented mathematics program on students mathematics achievement, computational proficiency, attitudes toward mathematics, and mathematical self concepts. Additionally an attempt was made to describe the learning characteristics of gifted students, and how computer problem solving affects their mathematical development. High ability fifth grade students participated in a year long class in which the time spent on computation was reduced, and in which the major emphasis was placed on problem solving and concept development, with calculators and microcomputers used extensively as tools. Statistical analysis indicated a significant difference favoring the treatment group on advanced topics and computation measures, with no evidence of significant differences between the treatment and comparison groups on measures of rate of learning, enjoyment of mathematics, value of mathematics, and self-concept. Analysis of student computer programs and observation of the students indicated that extensive computer problem solving (1) enhanced students' understanding of mathematical topics to an advanced level, (2) that computer programming aided in development of problem solving strategies, (3) and using problem solving strategies aided in the development of computer programming.

## THE EFFECTS OF APTITUDES AND STRUCTURALLY DIFFERENT METHODS OF TEACHING MATHEMATICS ON ACHIEVEMENT AND SATISFACTION

Higab, Ahmed Kamal Ahmed, Ph.D. *University of Southern California*, 1983. Chairman: Professor Richard E. Clark

The objective was to investigate the possible effects of selected aptitudes and two methods of teaching mathematics on achievement and satisfaction toward the method of teaching. Four groups of high school students were assigned randomly to two different methods of teaching mathematics: (1) the "Structured" method was highly sequenced and logical; (2) the "Scrambled" method was deliberately disorganized by using a table of random numbers. In the first meeting, all students took the SRA Tests of Educational Abilities which included three subtests--Quantitative aptitude, Reasoning aptitude, and language. In the following four meetings, students learned a unit of math. That unit was taught by the assigned method of teaching. In each meeting about thirty minutes were devoted for teaching a new math skill by reading some specially-designed printed materials. The last fifteen minutes were reserved for collecting the data by administering an achievement test (25 items) and a satisfaction questionnaire (12 or 13 items). Data from only 58 students were analyzed because of missing data.

All combinations between aptitudes, sex, teacher and treatment were considered for analysis with each of the criterion variables. Eighteen hypotheses were develcped and tested to cover all possible combinations. Multiple regression analysis showed only two significant aptitude-treatment interactions: (1) between reasoning aptitude and teacher with achievement as a criterion variable; and (2) between quantitative aptitude and sex with achievement as a criterion variable. Analysis of Covariance showed a significant interaction between method and grade level, $F = 4.101$, $p < .023$ with achievement as dependent variable. ANCOVA also showed a high significant interaction between the same factors, $F = 4.258$, $p < 0.001$ with satisfaction as dependent variable.

Canonical correlation showed no significant relationship between aptitudes and the two criterion variables. Wilk's lambda was 0.8962, $p < 0.4320$ for the first canonical variate. The overall test for the second canonical variate was also not significant (Wilk's lambda = 0.9842, $p < 0.650$). Multivariate Analysis of Covariance showed no significant interaction of method and sex, Wilk's lambda = 0.88666, $F(2,50) = 3.13216$, $p < .052$). MANCOVA also showed no significant interaction between method and grade level, Wilk's lambda = 0.75679, $F(4,60) = 2.24265$, $p < 0.075$.

## THE EFFECTS OF A SUMMER LEARNING PROGRAM AND A PARENT TRAINING PROGRAM ON CHILDREN'S ACHIEVEMENT AND SELF-CONCEPT

Order No. DA8227062

High, Jane, Ed.D. *George Peabody College for Teachers of Vanderbilt University*, 1982. 155pp. Major Professor: Jeanne M. Plas

The purpose of this study was to investigate the effectiveness of the Summer Learning Program (SLP) and the Parent Training Program (PTP) at the Dede Wallace Center, an urban community mental health center. The SLP was an intensive 8-week treatment program for children with emotional, behavioral, and learning problems. The study was significant because it provided useful information for improving the programs and for developing future programs offering a combination of psychological and educational services for children.

The study participants were 36 children, ages 6 to 13, and their parents. Most of the children were from single parent low-income families. Twelve children were randomly assigned to each of two SLP treatment groups, one group whose parents were involved in the PTP and one group whose parents were not involved. The comparison group was composed of 12 children who were referred to the SLP and were unable to participate.

A two-factor analysis of variance with repeated measures on the second factor was used to investigate the hypotheses. The findings indicated that the children who participated in the SLP (the treatment groups) made significantly greater gains in reading skills (as measured by the Woodcock tests) and significantly greater gains in mathematics skills (as measured by the KeyMath tests) than the children in the comparison group. The results failed to support the prediction that the SLP participants whose parents were involved in the PTP would make greater gains in reading and mathematics skills than the participants whose parents were not involved. No significant differences were found between the treatment groups and the comparison group in scores on the Piers-Harris Self Concept Scale. The parents of children in both treatment groups expressed high levels of satisfaction with SLP services.

The study results provided evidence indicating that children with school-related problems can make significant gains in reading and mathematics skills during an intensive summer intervention program. Further research is needed to identify the types of problems most effectively treated by programs similar to the SLP and the PTP and the specific components of the programs that are most effective.

### POST-SECONDARY VOCATIONAL-TECHNICAL SCHOOL BASIC MATHEMATICS: A DESCRIPTION OF COMPETENCIES WITH CORE CURRICULUM RECOMMENDATIONS

Order No. DA8322869

HINTON, BARBARA E., ED.D. *University of Arkansas*, 1983. 184pp.
Major Professor: Rhonda L. Harvey

The purpose of this study was to determine the specific mathematics competencies which should be included in a standardized area post-secondary vocational-technical school mathematics core curriculum. A 63-item questionnaire based upon a sequential list of mathematics competencies was designed and field-tested. A rating scale was used to rate the participants' agreement/disagreement with the need for a given competency for every graduate.

Five source groups were identified as having an interest in area post-secondary vocational-technical school curriculum development and as being cognizant of the mathematics needs of all vocational-technical graduates. These groups included vocational-technical school administrators, program instructors, mathematics instructors, graduates, and craft advisory council members.

Three separate statistical treatments were used with the data grouped by source group, by program affiliation, and by school affiliation. Means, standard deviations, and frequency distributions were used to describe the groups' ratings on each item. One-way ANOVAs, the Student-Newman-Keuls procedure, and an estimate of omega squared were applied to test and interpret the strength of association between group membership and the rating of an item.

Findings indicated that all three groupings identified items dealing with whole numbers, fractions, decimals, measures, tables, graphs, and calculators as essential for every graduate. Several items had *F* ratios which reached the level of statistical significance at the .05 level. However, these *F* ratios were of no practical importance since the descriptive statistics clearly defined each item on the inclusion/exclusion issue. From the estimate of omega squared and the Student-Newman-Keuls procedures, it was inferred that differences among the groups were small.

This study has implications for secondary and post-secondary vocational-technical school curriculum planners. It also has implications for post-secondary students, administrators, and instructors as well as employers of post-secondary vocational-technical school graduates.

### THE CUMULATIVE EFFECTS OF INCREMENTAL PRACTICE ON THE RETENTION OF MATHEMATICAL RULES

Order No. DA8314190

HORINE, JULIE ELAINE, PH.D. *The Florida State University*, 1983. 122pp.
Major Professor: Robert M. Gagne

The purpose of this study was to examine the cumulative effects of incremental practice on the retention of mathematical rules. Fifty-four fifth grade students were instructed by the same instructor over a three week period of time in the addition and subtraction of fractions. Students were ranked and paired according to standardized mathematics scores from the California Comprehensive Tests of Basic Skills test.

Members of each pair were randomly assigned to one of two treatment groups, one consisting of daily practice problems reflective of the skills taught that day (nonincremental) and the other, daily practice problems reflective of skills taught since the first day of the instructional unit (incremental). A unit posttst was administered immediately following the instructional unit and a delayed retention test was administered two weeks later.

An Analysis of Covariance indicated that the use of incremental practice had no significant effect on student performance on either the immediate posttest or the delayed retention test. The entry skills test covariate accounted for most of the explained variance.

There were no significant differences in attitude toward mathematics as a result of the treatment. However, results of a Multiple Regression Analysis indicated that the use of incremental practice produced more favorable attitudes toward mathematics for students with low entry skills that the use of nonincremental practice.

Results also indicated a significant relation between the degree to which students maintained previously learned skills and how well they performed on both the immediate posttest and the delayed retention test.

### PEER TEACHING IN A CALCULUS CLASSROOM: THE INFLUENCE OF ABILITY

Order No. DA8313587

HURLEY, ELIZABETH ANN, ED.D. *The University of Rochester*, 1982.
128pp. Sponsor: Dr. Norman Gunderson

Peer teaching is an instructional strategy involving switching of "teacher" and "student" roles usually within pairs. Advantages include the encouragement of active learning, especially in the "teacher" during the process of organization to explain to another. The "student" benefits from immediate feedback and encouragement to participate.

The model for the present study was developed at McGill University, where participants prepared questions for their partners and role switching was essential. The present study was designed to investigate the effect on achievement of forming pairs according to ability. Ability was defined as a student's SAT-M score and achievement as the final course average.

In the fall of 1981, twenty-one pairs and one triad were formed in a Calculus I class at Wells College. Random pairing was done within four groups: High-Low; Medium-Low; High-Medium; Medium-Medium. Once a week, assigned partners worked on exercises given by the instructor. Also, at the end of the semester, students were asked to individually evaluate their peer teaching experience.

A two by four table was formed with the four groups mentioned above as columns and whether a student was high or low in SAT-M score in the pair as rows. Analysis of variance across groups indicated groups did not vary significantly from each other in achievement. The students who had the higher SAT-M score of the pair did achieve significantly better than the students who had lower SAT-M scores in their pair, however. No interaction effects were found.

A qualitative analysis of the evaluations indicated more negative comments by the High-Low group and more communication problems. On the other hand, the Medium-Medium group had the most positive comments. Also, perceived ability was found to be an important predictor of peer teaching effectiveness, more so than measured ability. Low perceived ability, perhaps resulting in part from the nature of the course as part of the masculine domain, existed in all groups.

Therefore, although no significant difference was found among groups in achievement as measured by final course average, student comments strongly suggested that perceived ability and difference of perceived ability within a dyad did influence effectiveness.

## LINEAR ESTIMATION ABILITY AND STRATEGY USE BY STUDENTS IN GRADES TWO THROUGH FIVE

**Order No. DA8314296**

**Immers, Richard Carl, Ph.D.** *The University of Michigan*, 1983. 237pp. Chairman: Arthur F. Coxford, Jr.

Recently, both the NCTM and the NCSM identified the estimation of measures as an essential mathematical skill. Aside from the Piagetian studies on measurement concept attainment, little is known about how students acquire skill in this area. The purpose of this study was to determine the present status of linear estimation skills as practiced by elementary students.

A pretest-posttest control group design was used in the study. A sample of 192 students in grades two through five at one elementary school participated in the investigation. Forty-eight students at each grade level were randomly assigned to one of two treatment groups, experimental or control. The researcher prepared a Piagetian task, an interview, a pretest, a ten-day microcomputer-based instructional unit, a written posttest, a computerized posttest, a transfer test, and a retention test. Data were gathered to test fifteen null hypotheses.

The ability to estimate length was significantly, positively correlated with age for both treatment groups. In addition, the ability to estimate length may be related to school ability and mathematical ability. While statistically significant, these correlations were modest.

Significant differences were found between grade levels with regard to linear estimation ability. Generally speaking, the higher the grade level the more accurate the estimate or production. No significant sex differences were observed.

Instruction proved most effective for long and vertical estimates--the two weakest pretreatment areas. Instruction benefitted not only students in grades three through five equally, but both sexes as well.

Small but significant treatment effects were found for short and horizontal estimates on the written posttest in favor of the experimental group. Large treatment and treatment-by-grade effects were found for each corresponding subdivision on the computerized posttest.

The amount of transfer exhibited by the experimental group was extremely low. Surprisingly, both treatment groups demonstrated an overwhelming to underestimate length in novel situations.

The retention data suggest that overlearning may have occurred.

Unit iteration was the strategy most frequently used by the subsample interviewed. Students were consistent across tasks in their use of one strategy. Moreover, strategy use did not change as a result of incidental practice.

## THE EFFECT OF A COMMUNITY COLLEGE DEVELOPMENTAL COURSE ON ACADEMIC ACHIEVEMENT

**Order No. DA8308621**

**Jackson, Leonard Ray, Ed.D.** *University of Washington*, 1983. 172pp. Chairperson: Associate Professor Samuel E. Kelly

The study sought to evaluate the effect of an experimental college survival course developed and taught for educationally developmental students at a Washington State community college. The study examined the relationship between class participation and change in grade point average. The freshmen students enrolled in the college survival course were compared to a control group of freshmen who were not enrolled in this course. Dependent variables included academic achievement or grade point average. Differences in grade point average with credit load partialed out were also studied. Student self-perception of reading, English, math and personal/social skills was included in the analysis. Additionally, student evaluations of the course were also analyzed.

Students' learned survival skills and other gains resulting from exposure to the course were measured by a post-assessment evaluation survey. The course curriculum was evaluated as regards the suitability for the particular group of students served. Studen progress was determined by analysis of answers to examination questions, student journals, and from evidence recorded in the instructor's class records. The results disclosed a significant difference in grade point average in favor of the experimental group when compared to the Control group.

A survey of students who completed College Survival class indicated that 91 percent rated the course as very valuable in terms of their college survival. At the end of the study, recommendations for course improvement were discussed.

## RELATIONSHIP OF ELEMENTS OF INDIVIDUALIZED INSTRUCTION TO ARITHMETIC ACHIEVEMENT

**Order No. DA8229071**

**James, Rebecca Lou, Ed.D.** *University of Houston*, 1982. 112pp.

*Purpose*. The purpose of this study was to identify the degree of positive relationship between the elements of individualized instruction and arithmetic concepts and computation achievement by second grade students.

*Procedure*. The elements of individualized instruction which served as independent variables were synthesized from those found to occur most often in related literature. They were the use of sequenced outcome objectives, preassessment procedures, alternative learning resources, variable learning rate, and mastery postassessment procedures.

To examine the correlation of the five elements of individualized instruction to students' arithmetic achievement, a quasi-experimental pretest-posttest design was used. The unit of measure was the classroom. Thirty-two second grade teachers participated. The instruments were the Stanford Diagnostic Arithmetic Test, Level I, with alternate forms. W (Harcourt, Brace, and World, Inc., 1966) and X (Harcourt, Brace, and Javoncevitch, 1968) as well as the Report of Individualized Classroom Instruction. Pearson product-moment correlation was used to analyze the data. The significance level was set at .05.

*Results*. Three of the correlations were found to be significant and positive for second grade students' arithmetic computation achievement. They were the use of sequenced outcome objectives ($r = +.47$, $P < .05$), the use of mastery postassessment procedures ($r = +.34$ $P < .05$), and the use of the set of elements ($r = +.40$, $P < .05$). One of the elements was found to be significant and positive for second grade students' achievement of arithmetic concepts. Alternative learning resources correlated at $r = +.37$, with a $P < .05$.

## AN INVESTIGATION OF DIFFERENCES IN VERBAL ABILITY AND MATHEMATICAL ABILITY AMONG TALENTED MALE AND FEMALE HIGH SCHOOL STUDENTS

**Order No. DA8229072**

**Janes, Catherine John, Ed.D.** *University of Houston*, 1982. 113pp.

*Introduction*. Discovering and meeting talented youth are fascinating and enlightening experiences. Since interest in talented youth has increased over the past few years, methods of identification and programs for the talented have been developed and implemented in various areas and school districts in the country.

*Purpose of the Study*. This study focused upon youth talented in the performing and visual arts, and investigated the variables of gender, verbal ability, and mathematical ability. The three null hypotheses tested were as follows: (1) Performing arts students are indistinguishable from visual arts students in terms of gender, verbal ability, and mathematical ability. (2) There are no distinguishable differences between male and female performing and visual arts students in terms of verbal ability and mathematical ability. (3) Male and female students are indistinguishable in terms of performing and visual arts membership, verbal ability, and mathematical ability.

*Procedures*. Subjects were 98 tenth grade students: 56 performing arts students--26 male, 30 female; and 42 visual arts students--22 male, 20 female. Only female performing arts students were randomly selected. Due to low numbers, all visual arts students and male performing arts students were used. The clientele was basically middle socioeconomic range with ethnic breakdown of 70% Anglo, 20% Black, and 10% Mexican-American. In November, 1981, these students were administered the Verbal Reasoning (Verbal Ability) and Numerical Ability (Mathematical Ability) subtests of the Differential Aptitude Tests. Raw scores were collected and analyzed using discriminant analysis significant at the $p < .05$ level.

*Results*. Findings were as follows: (1) Gender, verbal ability, and mathematical ability were non-significant predictors of performing and visual arts membership. (2) Verbal ability and mathematical ability were non-significant predictors of male and female performing and visual arts membership. (3) Performing and visual arts, verbal ability, and mathematical ability were non-significant predictors of gender membership.

*Conclusions*. The study found that students talented in the performing and visual arts were a homogeneous group, i.e., they did not differ significantly in terms of gender, verbal ability, and mathematical ability. The study also found that students talented in the performing and visual arts were talented in verbal and mathematical abilities as well.

### CHANGE AND SECONDARY SCHOOL STUDENT ACHIEVEMENT IN THE BASIC SKILLS: COSTS, OBSTACLES, STAFF PERCEPTION

**Order No. DA8307680**

Jarrach, George Edward, Ed.D. *New York University*, 1982. 191pp. Chairman: Professor LaMar Miller

De-emphasis of public education on the national level, legal challenges to financing on the state level and demand for minimal student competencies on the local level dramatize one conclusion: schools must change.

This study identifies, describes and evaluates mandated change in secondary schools which did not meet minimum standards on the New Jersey Minimum Basic Skills Test. This study isolates those alterable factors found deficient, identifies the activity to eliminate the deficiency and determines the cost to implement the activity.

Forty alterable factors based on research were grouped into six categories on the "Comprehensive Basic Skills Review" (CBSR). Schools responded to the CBSR with a remedial plan. These plans served as the framework for interviews conducted among forty-four teachers, supervisors and administrators in three high schools. Data were verified through observation, participation and document analysis.

The research problems addressed were: (1) What CBSR recommendations were implemented? (2) What costs were associated with the changes implemented? (3) What obstacles were encountered? (4) What was the perception of staff concerning reasons for improved scores? (5) What other changes were made which were not included on the CBSR report which might have contributed to increased scores?

Data analysis indicated all but two CBSR recommendations were implemented. The mean cost per student to implement change was $271.88 distributed as follows: Basic Skills Math/Instructional Time, 38%; District Policies and Procedures, 24%; Basic Skills Reading/Instructional Time, 23%; Staff Knowledge and Attitude, 14% and Parent/Community Relations, 1%. The most cost-effective programs were similar: class size averaged 14, teachers were certified, student progress was monitored.

One reported obstacle indicated supervisors had difficulty developing basic skills inservice activities for high school teachers.

It was almost unanimously agreed that the CBSR process was responsible for increased student scores.

One change not on the CBSR was the emphasis of test-taking skills by the teacher.

The findings indicate that schools, although resistant, will change if mandated by the state. Because cost is important, it was recommended the state compute a cost-effectiveness analysis to determine the expenditure for each unit of student growth. Finally, basic skills should be infused into content areas for students with deficiencies.

### THE RELATIONSHIP BETWEEN PUBLIC SCHOOL TEACHER STRIKES AND STUDENT PERFORMANCE ON SELECTED COGNITIVE AND AFFECTIVE TESTS OF THE EDUCATIONAL QUALITY ASSESSMENT IN PENNSYLVANIA

**Order No. DA8320886**

Jeffreys, Loretta Macomber, Ph.D. *The Pennsylvania State University*, 1983. 122pp. Adviser: William E. Caldwell

This study was designed to test whether or not public school teacher strikes had any relationship to student achievement on six subtests of the Pennsylvnia Educational Quality Assessment (EQA) inventory between 1978 and 1982. All districts which were used in the study had been strike free for at least four years prior to the first testing. Thirty-four school districts were identified which had completed the test inventory both before and again after experiencing a teacher strike. A control group of 34 districts which had taken the EQA tests in the same years as the strike districts but which had remained strike free during this period was matched with the strike districts on the basis of district size and wealth. Students in grades five, eight, and eleven participate in the state EQA testing program, and mean school scores were made available by the Pennsylvania Department of Education.

An analysis of covariance which entered scores of the first EQA tests as covariates was utilized to compare the scores of strike and nonstrike buildings in the posttests. Significantly less gain in student scores were found in the fifth grade tests of Self-Esteem, Mathematics, and Interest in School and Learning, and in the eighth grade test of Writing. No significant differences were found in any test at eleventh grade or in the other tests for grades five and eight. An analysis of covariance was also utilized to test for the durability of any strike effect. The strike schools were divided into groups of schools on the basis of the time which elapsed between the strike and the second EQA examination. Each group was compared to the nonstrike group in this analysis, with the pretests scores again entered as covariates. No consistent pattern of declining strike effect was found.

### SPATIAL VISUALIZATION ABILITY: EFFECTS OF LONG TERM PRACTICE AND RELATIONSHIP TO MATHEMATICAL ABILITY

**Order No. DA8311412**

Johnson, Margaret Akers, Ph.D. *The University of Arizona*, 1983. 148pp. Director: Karen Paulsen

This investigation was designed to test a hypothesis formulated by Julia Sherman (1967) concerning the development of spatial visualization and mathematic skills. The intention of this study was to examine the influence of early physical training on spatial visualization and mathematic skills, to determine whether intensive training in spatial relations would have a differential impact on male/female spatial performance and to gather information concerning the relationship between spatial visualization and mathematic performance.

The investigation was divided into three studies and used 166 college students as subjects. Study one examined the impact of long term physical training, gymnastics, on spatial visualization and mathematic scores of two matched-groups selected from 99 subjects. The two groups, gymnast and control, each consisted of 28 subjects (14 males and 14 females) and were matched on IQ score, age, ethnic group, socioeconomic status, parental and sex-role identification, achievement motivation and years of training in other sports. Gymnasts averaged 5.5 years of gymnastic training; the control group had none. Study two examined spatial visualization scores obtained by 67 architectural students (49 males and 18 females) before and after a semester's training in spatial relations. Study three compared scores obtained by all 166 subjects on the Shepard Metzler Mental Rotation Test and a mathematic test derived from the Otis Test of Mental Abilities.

The test of the hypothesis relating to the influence of early physical training on spatial and mathematic performance was not successful as the training of the gymnasts did not extend to early childhood. While significant sex-related differences favoring males were found in spatial performance, the amount of variance in spatial scores accounted for by sex was small, only 8%. No significant sex-related differences in mathematic performance were found. In study two, both males and females significantly improved spatial performance following training, but females did not demonstrate a significantly greater rate of improvement as predicted. The results of the third study indicated a moderate positive relationship between spatial and mathematic performance, however, no evidence was found to support a direct causal relationship between spatial skill and mathematic performance.

### AN INVESTIGATION OF TRANSFORMATIONAL GEOMETRY WITH SPECIAL REFERENCE TO THE HIGH SCHOOL MATHEMATICS CURRICULUM OF NEW ZEALAND

Order No. DA8313446

**JOHNSON, MURIEL R., ED.D.** *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 316pp. Chairperson: Carolyn A. Maher

The mathematical and pedagogical rationale for adopting a transformational approach to geometry in high school mathematics programs includes the fact that the underlying concepts of a transformational approach to geometry--function, invariance and group--have the power not only to classify and characterize diverse geometries but also to unify geometry with the rest of mathematics. Also, since transformations can be regarded as mathematical models of physical phenomena, such a course lends itself to an intuitive, activity-based approach, offers the opportunity for a meaningful investigation into the nature of space and encourages first-hand experience of the process of model-building.

Transformational Euclidean geometry forms a component of New Zealand's current unified high school mathematics curriculum. An analysis of the geometry program was carried out and a new program developed focussing on the unifying nature of transformational theory and the underlying notion of group structure, emphasizing the process of model-building, and encouraging, through the use of concrete activity, an intuitive approach to the inherent spatial considerations of each geometry studied.

The new program, which potentially enriches the present curriculum, deals with four major plane geometries. These can be described in intuitive terms as environmental; that is, Euclidean geometry deals with objects that "look alike" in the environment, affine geometry with shadows from the sun, projective geometry with vision, and topology with distortion.

Transformational theory provides a unifying structure and method of study for these geometries. Initially, in grade 8, the study of the transformations and the associated invariants of each geometry is intuitive, using physical models. In grade 9, the study is extended to mathematical models and the notion of a transformational group is introduced intuitively. In grade 10, algebraic models and methods of proof are introduced. Finally, in grade 11, the focus of study is on the interrelationship of these geometries: their transformation groups, their properties of invariance and their associated equivalence relations.

### INTERACTION OF GENERAL REASONING ABILITY AND LOCUS OF CONTROL WITH INSTRUCTIONAL TREATMENTS IN ALGEBRA I

Order No. DA8227670

**JOHNSTON, GEORGEANN VANN, PH.D.** *The University of Texas at Austin*, 1982. 105pp. Supervisor: L. Ray Carry

Interactions were sought between two naturally occurring instructional treatments in high-school Algebra I classes and a linear combination of general reasoning ability and locus of control. It was hypothesized that the instrumental treatment would provide higher achievement in students with lower general reasoning ability and external locus of control and that the relational treatment would result in higher achievement for students with higher general reasoning ability and internal locus of control. The criterion measure was an achievement test that was designed by the investigator to measure levels of attainment of the concepts presented in the Algebra I classes.

The two instructional treatments, instrumental and relational, were based on instructional characteristics of teachers. The instrumental treatment was described in terms of mastery and specificity of objectives. The relational treatment was described in terms of more general objectives and more student responsibility for final learning outcomes.

The two student aptitudes, general reasoning ability and locus of control, were operationally defined. General reasoning ability was defined in terms of an individual's ability not only to comprehend an abstract system but also to synthesize and apply information from that system in other situations and was measured by the Necessary Arithmetic Operations (NAO) Test. Internal-external locus of control, the degree to which an individual believes that he/she can alter the outcome of a situation, was measured by a scale specifically designed for aptitude-by-treatment-interaction (ATI) research in the area of mathematics.

The interactions sought were not statistically established.

### SELF-INSTRUCTION AND CHILDREN'S MATH PROBLEM SOLVING: A STUDY OF TRAINING, MAINTENANCE, AND GENERALIZATION

Order No. DA8310981

**JOHNSTON, MARY BETH, PH.D.** *University of Notre Dame*, 1983. 129pp.

This study compared two training formats, self-instruction and didactic instruction, and two instructional contents, a task-specific strategy and a general and task-specific strategy, and assessed the extent to which these affected math problem-solving on training, maintenance, and generalization tasks. In addition, the research examined the relationships of three individual difference parameters, prior math knowledge, attributions of personal causation, and intrinsic interest, to performance on the training and generalization tasks. During training, self-instruction resulted in greater accuracy than didactic instruction. The superiority of self-instruction was most evident when the content of the instructions consisted of both general and task-specific content conditions solved more problems than their peers in the self-instruction format and general and task-specific content conditions. During maintenance, while those in the task-specific condition continued to solve more math problems per trial than those in the general and task-specific condition, the earlier superiority of didactic instruction over self-instruction was no longer evident. Neither the format nor the content of the instructions had a significant impact on accuracy on the generalization tasks. With respect to the individual difference parameters studied, several conclusions can be drawn. First, prior math knowledge predicted accuracy on the training, maintenance, and generalization tasks, and accounted for more than 50% of the variance on the latter tasks. While children with internal personal causation constructs benefited equally from the various training procedures, those with external personal causation constructs profited more from the self-instructional format and the task-specific content. Finally, the children in the specific content condition appeared to increase their intrinsic interest in math problem-solving more than their counterparts in the general and task-specific content condition.

### ACADEMIC ACHIEVEMENT, ATTITUDES, AND CLASSROOM BEHAVIOR DIFFERENCES RELATED TO PARTICIPATION AND NONPARTICIPATION IN PROJECT FOLLOW THROUGH IN WASHINGTON, D.C.

Order No. DA8315342

**JONES, AMY ANN ANTHONY, ED.D.** *The George Washington University*, 1983. 173pp. Chairperson: Frederick James Brown, Jr.

The purpose of this study was to compare the academic achievement, attitudes, and classroom behaviors of students who did and did not participate in Project Follow Through in District of Columbia Public Schools. The sample consisted of 170 Project Follow Through students and 163 nonparticipating students in grades two and three and their teachers.

The following hypotheses were tested: (1) There are significant differences between the academic achievement of students who participate in Project Follow Through and those who do not. (2) There are significant differences between their attitudes toward reading and mathematics. (3) Their teachers perceive significant differences between their classroom behaviors.

According to the findings, Hypothesis 1 was supported. Hypothesis 2 was rejected, and Hypothesis 3 was supported for 9 of the 11 behavior factors and 27 of the 47 factor items.

The instruments used were the Comprehensive Tests of Basic Skills for academic achievement in reading and mathematics, the Survey of School Attitudes, and the Devereux Elementary School Behavior Rating Scale. The data collected from the above instruments were subjected to a detailed statistical analysis. Significant differences were tested by use of the $t$ test at the .05 level of significance.

The following conclusions are based on the findings of the study. Project Follow Through significantly affects students' achievement in reading and mathematics. Programs like Project Follow Through can be effective in fostering positive classroom behaviors related to classroom work. Project Follow Through-type programs can be effective in reducing student behavioral difficulties in the classroom and in making students independent and responsible for their own behavior.

The following recommendations are based on the findings and conclusions of this study: Schools should continue to provide this type of program to disadvantaged students. Subsequent testing should take place in the intermediate grades to determine whether students' academic achievement in reading and mathematics continues. School administrators should consider evaluating attitudes along with achievement in examining the effects of these programs. Teachers should examine the classroom behaviors of their students to determine whether they interfere with student learning and academic achievement.

## EFFECTS OF TIME SPENT IN AN ENRICHMENT PROGRAM FOR GIFTED AND TALENTED STUDENTS

Order No. DA8228902

JONES, WALTON CRIST, D.ED. *The Pennsylvania State University*, 1982. 185pp. Adviser: Edmund C. Short

The effects of time spent in an enrichment program for gifted and talented students were assessed. Specifically, the purpose of the research was to determine: (1) the main effects between subjects due to experience level, and (2) the interaction effects between subjects due to grouping by tests.

A review of research literature and current curricular models indicated six performance components that should be included and evaluated in enrichment programs. These are: (1) critical thinking, (2) creative thinking figurally, (3) creative thinking verbally, (4) self-concept development, (5) reading achievement, and (6) mathematics achievement. Outcome measures for each of these six variables were used in the study.

The population for this study was comprised of 82 students identified as gifted that were assigned to three groups by duration of involvement in the enrichment program, i.e., one, two, or three years. All three groups participated in the Seminar for Gifted and Talented Children administered by the Lincoln Intermediate Unit # 12 (Pennsylvania). The Seminar meets in satellite schools for three hours each week. Students are released from regular class to engage in enrichment activities coordinated by an itinerant resource teacher of gifted children.

The period of time utilized for research purposes was 42 hours of Seminar exposure. Six pre-tests and six post-tests were administered prior to and following the Seminar period, respectively, relative to the six areas of concern.

Six standardized instruments were used to collect data for the six respective areas of concern: (1) The Otis-Lennon School Ability Test; (2) the Torrance Tests of Creative Thinking, Figural; (3) the Torrance Tests of Creative Thinking, Verbal; (4) the Piers-Harris Children's Self-Concept Scale; (5) the Metropolitan Reading Achievement Test, and (6) the Metropolitan Mathematics Achievement Test.

Analysis of variance was applied to the summary of mean gain scores for pre- and post-test results. To determine which components of the data caused significant differences, a t-test was applied.

Findings indicated significant main effects for creative-thinking--figurally and verbally, and for reading achievement. Interaction effects were significant for both components of creative thinking. The Seminar exposure period of 42 hours was significant for all groups in all six areas of concern.

## SEX ROLE IDENTITY AND ITS EFFECT ON ACHIEVEMENT ATTITUDES AND BEHAVIORS

Order No. DA8324210

KACZALA, CAROLINE MARY, PH.D. *The University of Michigan*, 1983. 239pp. Co-Chairpersons: Jacquelynne Eccles, M. Clemens Johnson

This study examines the relationships between sex roles and achievement in the areas of mathematics and English. The principal questions were: (1) Do males and females differ in mathematics and English achievement? (2) Is achievement related to attitudes and expectancies? (3) Are attitudes toward mathematics and English related to sex role identities? (4) Under what conditions are the effects of sex roles the strongest?

The sample included approximately 750 male and female students in grades five through twelve. Students attended seven schools in a suburban school district in a predominately white, middle class community. Data were collected to measure students' ability, task and value perceptions of mathematics and English, sex role identity, sex role salience and achievement in mathematics and English.

Boys and girls differed very little in mathemaics and English achievement but where significant differences occurred girls performed better in both mathematics and English than did boys. Girls held significantly more positive attitudes toward English while boys held significantly more positive attitudes toward mathematics. Attitudes toward mathematics became more negative with age for both girls and boys. Perceptions of English ability became more positive with age. Correlations between attitudes and achievement were low to moderate in size.

Sex role identity was related to the perceived value of mathematics and English. Androgynous respondents held more positive attitudes toward both mathematics and English than did masculine, feminine or undifferentiated respondents. Sex role by salience interactions were marginally significant for females' perceptions of the value of English and mathematics and males' perceptions of English ability and task construct. When sex role was salient androgynous respondents held more positive attitudes than did traditionally sex typed respondents. This difference did not exist when sex role was non salient.

The results suggested a continuing need for the study of sex typing of achievement areas. Sex typing of mathematics may have a particularly negative effect on females' perceptions of its value.

## A STUDY ON GROUP INSTRUCTION VS. DIRECTED STUDY TECHNIQUES FOR TEACHING COMPUTER PROGRAMMING TO GIFTED SECONDARY MATHEMATICS STUDENTS

Order No. DA8317519

KASILUS, MARTHA HENDRICKS, PH.D. *Georgia State University - College of Education*, 1983. 184pp.

*Purpose.* This study sought to design, implement, and evaluate two computer courses for gifted secondary school students; to predict student achievement; and to determine if there are differences with regard to sex in ability to learn computer programming and attitudes toward computer science.

*Procedure.* The 93 subjects for this study were participants in the Governor's Honors Program in 1979. Two teaching strategies, a direct group instruction approach ($T_1$) and a directed independent study approach ($T_2$), that incorporated the same course content comprised the two treatments.

This study used a multigroup pretest-posttest design. The instruments used were: View of Mathematics Inventory (VMI), Barron Independence of Judgment Scale (BIJ), Internal-External Locus of Control (LOC), Test of Computer Programming Ability (TCA), Test of Prerequisite Knowledge (TPK), Student Information Profile (SIP), and Number of Computer Programs Completed (NPC). Analysis of covariance, $t$ tests, correlations, multiple regressions, and discriminant analysis were used to assess 12 hypotheses.

*Results.* Both treatment groups scored significantly higher on the post-TCA ($p < .0005$) than on the pre-TCA. Neither teaching method significantly changed the subjects' attitudes toward computer science, independence of judgment, or locus of control.

It was not possible to predict the scores on the post-TCA based on the view of computer science, locus of control, or independence of judgment. NPC could be predicted by post-BIJ, post-VMI, and post-LOC for $T_1$. For $T_2$ none of the tests predicted the number of programs run.

A subject's sex did not affect his or her ability to program a computer or attitudes toward computer science.

*Conclusions.* The design of a computer course in which the computer is used to study mathematical concepts was accomplished. Sex was not a factor in either the subjects' abilities to write and run computer programs or attitudes toward computer science. For gifted secondary school students, both the direct group instruction and the directed independent study approaches appear to be effective means of teaching computer programming.

## AN INVESTIGATION OF THE PREDICTIVE EFFICACY OF THE CLIFFORD W. BEERS PRESCHOOL SCREENING SURVEY AND SUBSEQUENT ACADEMIC ACHIEVEMENT AS MEASURED BY THE SRA ACHIEVEMENT BATTERY

**Order No. DA8319198**

KEEFE, BRENDA JOYCE, PH.D. *The University of Connecticut*, 1983. 110pp.

The purpose of this longitudinal study was to extend the knowledge of the process of preschool screening, relating to its predictive efficacy of subsequent academic achievement. This study investigated the predictive efficacy of the Clifford W. Beers Preschool Screening Survey (Beers Preschool Screening Survey) with regard to subsequent academic achievement as measured by the SRA Achievement Battery for a period of five years.

The sample consisted of 108 pupils in a public school system in a rural northeastern Connecticut community. The subjects were randomly selected from the total population of pupils attending kindergarten during the 1976-77 school year and who were in grade six at the time of the study.

Prior to entry into kindergarten, each pupil was administered the Beers Preschool Screening Survey to ascertain the readiness level. The Beers Preschool Screening Survey is a wide-mesh screen designed to yield an individual assessment of the developmental levels of pre-kindergarten children in six broad areas. They are: Language Cognition, Visual Motor, Visual Discrimination, Number, and Digit Span.

The study indicated that the results were inconclusive and that only some sub-tests of the Beers Preschool Screening Survey were statistically significant predictors of some sub-tests of the SRA Achievement Battery. Only four of the six sub-tests, Language Cognition, Visual Motor, Visual Discrimination, and Number had any predictive efficacy and of those four, none predicted academic achievement in all grades for all sub-tests of the SRA Achievement Battery.

Closer analysis suggested that the Beers Preschool Screening Survey had some predictive ability for the lower and upper ranges of academic achievement. However, as an instrument for the predictive efficacy of general academic achievement, the Beers Preschool Screening Survey appeared not to be appropriate.

In spite of the lack of predictive efficacy, a replication of this study with more complete data may provide further insight into the usefulness of this screening instrument. Further exploration of Language Cognition, Visual Motor, Visual Discrimination, and Number as predictors is suggested. If refinements are made in these specific areas, perhaps more significance could be attached to the predictive efficacy of the Beers Preschool Screening Survey.

## THE CHANGE FACILITATOR MODEL FOR MANAGING AND EVALUATING DEVELOPMENTAL STUDIES PROGRAMS APPLIED TO THE STUDY OF FRESHMEN ACHIEVEMENT AT THE MARYMOUNT COLLEGE OF VIRGINIA

**Order No. DA8229475**

KEIMIG, RUTH TALBOTT, ED.D. *The George Washington University*, 1982. 317pp. Chairperson: Joseph Arthur Greenberg

The Change Facilitator Model (CFM) was developed as a taxonomy and decision model for developmental studies programs. In the CFM, developmental programs and services are classified according to organizational structure and characteristics on two major dimensions: the extent to which they provide comprehensive, individualized services and the extent to which these services are institutionalized within the College and its "regular" academic program. Possible decisions on a comprehensive set of variables associated with successful programs are ranked according to their potential for improving the overall learning of college students through instructional development and change. The ranking of the program models and decisions was determined by the historical record of the demonstrated ability of those kinds of services to effect improvement in overall learning. Annotated summaries of the supporting research are provided within the CFM.

The study of freshman achievement and persistence at Marymount College of Virginia provides validation of the CFM. The empirical evidence supported its underlying precepts and the ranking. Evidence is presented that shows that educators expect developmental studies programs to improve overall learning within the institution and that these programs act as catalysts and energizers for evolutionary change in instruction.

The study provides evidence of the practicality and effectiveness of this role for developmental studies when the CFM is applied and evidence that faculty will use specialists' expertise and developmental services to improve instruction in their courses. The study also includes an analysis of the relationship of reading and mathematics achievement to overall grade-point average (GPA) and evidence that research designs using GPA criteria but excluding institutional factors are inappropriate to assess developmental studies programs.

The use of the Change Facilitator Model to analyze the data and prepare recommendations produced an "action list" for instructional change in the College.

## THE EFFECT OF TEST-WISENESS TRAINING ON THE ACHIEVEMENT AND CAUSAL ATTRIBUTIONS OF KOREAN AND HISPANIC ELEMENTARY STUDENTS

KIM, EUNJA CONNIE, PH.D. *University of Southern California*, 1983. Chairman: Professor Jeri Benson

The purpose of this study was to investigate the effects of test-wiseness training on achievement and causal attributions, and to discern any ethnic and sex differences in causal attributions of Hispanic and Korean elementary school children.

Previous studies have indicated that minority students in general have performed poorly on standardized tests and that this shortcoming can be attributed in part to lack of test-wiseness skills. Research has also shown that individuals' beliefs about the causes of success and failure are of major importance in understanding achievement-related behavior. Korean and Hispanic students were chosen for this study because Korean students have been characterized as highly competitive, well motivated, and high achievers. In contrast, Hispanics have been reported to be cooperative but generally poor achievers.

This study is important because no previous research has combined test-wiseness and causal attributions, nor have Korean-American groups been included in test-wiseness research. The study involved a sample of sixty-six subjects from one elementary school in the Los Angeles Unified School District. Subjects were selected on the basis of English proficiency and were randomly assigned to three treatment groups of equal size. The Pre- and Posttest Control Group Design was used to permit covariate adjustment because of possible ethnic differences in achievement. The results from the analyses of variance for the pretests indicated significant ethnic differences in reading and math achievement, as well as ethnic and sex differences in causal attributions ($P < .05$). The posttest regression analyses using the pretests as covariates showed no significant test-wiseness training effects on achievement nor on causal attributions. However, significant ethnic and sex differences were found in math attributions. The relationship between achievement and attributions was different across subject areas for each ethnic group.

Although findings of previous research were not supported by this study, there were indications of positive test-wiseness training effects on achievement for Hispanic students. Further research in this area may provide even greater insights for the development of effective instructional programs for the culturally different children.

(Copies available from Micrographics Department, Doheny Library, USC, Los Angeles, CA 90089.)

### PARENT TUTORING AND MATHEMATICS ACHIEVEMENT OF SIXTH-GRADE STUDENTS Order No. DA8311387

**Kinney, Patricia Ann**, Ph.D. *New Mexico State University*, 1983. 138pp. Chairman: Dr. Lloyd G. Cooper

Fifty-one parents and 51 sixth graders participated in an investigation of a parent-as-tutor model with geometry as the subject area. Three parental treatment groups were used. Parents in Group One, trained in tutoring and child management techniques, tutored their children in geometry during four weekly 15-minute sessions for 4 weeks and received counseling during this phase. Parents in Group Two were given two training sessions on child creativity. Parents in Group Three comprised the no-treatment group. All parents completed a survey of their attitudes toward education and their children's school.

Testing was done in a pretest-posttest, two-by-three factorial design with gains on a classroom geometry test as the dependent measure. Analysis of variance showed a significant main effect due to teacher, but none due to treatment group. Results of a median test performed on the Parent Opinion Survey showed a significant difference between treatment groups on the Utilitarian subscale only. Group Two tended to agree more with the Utilitarian concept than Groups One and Three. Significant negative correlations were found between gain score and parental responses on the Utilitarian subscale and between gain score and the Utilitarian subscale for the no-treatment group only.

Results did not support the hypothesis that the parent-as-tutor model improved the mathematics achievement of sixth graders, but support was found for the hypothesis that parental opinion was correlated with student academic achievement. Support was also found for the importance of the teacher on student achievement gain.

### SEX-ROLE SELF-CONCEPT AND COGNITIVE FUNCTIONING: THE RELATIONSHIPS AMONG ANDROGYNY, ATTRIBUTION, AND MATH AND VERBAL APTITUDES Order No. DA8315945

**Knopp, Sharon Lee**, Ph.D. *Northwestern University*, 1983. 182pp.

Early research on psychological androgyny emphasized correlates of personality and adjustment. This study broadens androgyny research to consider cognitive correlates. If androgynous people are more behaviorally flexible, because they are less inhibited by sex roles, are they also more intellectually flexible? Math and verbal aptitude measures show consistent sex differences, but evidence that these differences are innate is poor. This study explored relationships among math and verbal aptitudes and sex-role self-concept (representing internalized sex-role conditioning) and choice of major. Causal attributions for intellectual performance were also considered, since they may mediate socialization and performance.

Northwestern University undergraduates (N = 907) contributed data on: (1) sex-role self-concept (Bem Sex Role Inventory), (2) math and verbal aptitudes (Scholastic Aptitude Test-SAT), (3) Luck, Effort, Ability, and Difficulty attributions for math and verbal SAT scores (Attributions Questionnaire using Weiner's dimensions of locus and stability), and (4) academic major.

Contrary to expectation, no statistically significant relationship was found between sex-role self-concept and SAT discrepancy. Sex-typed people did not have sex-typed SAT's. Androgynous people had lowest, not highest composite SAT's. High SAT's were associated with *low* Masculinity, Femininity, or Androgyny, not with any high self-concept variable.

Sex-typed people with sex-appropriate SAT's made higher Ability and lower Luck and Difficulty attributions for their sex-appropriate aptitude than for their sex-inappropriate aptitude. Sex-typed people with sex-inappropriate SAT's showed statistically insignificant tendencies to make SAT attributions supporting their major. Androgynous people made higher Ability and lower Luck attributions for high SAT's than for low SAT's. Luck and Difficulty differences were inconsistent. Sex-role self-concept contributed little to attributions compared to SAT scores.

Among people with sex-typed SAT's, majors chosen by androgynous people were less sex-typed than those chosen by sex-typed people. Androgynous men in general chose a wider variety of majors than sex-typed men, but feminine women were more flexible than androgynous women.

The inconsistent findings were interpreted recognizing the sample's high achieving homogeneity and the need to identify multidimensional content in Bem's recently proposed gender schema.

### AN ANALYSIS OF COGNITIVE FUNCTIONING OF KOREAN MIDDLE SCHOOL STUDENTS Order No. DA8303621

**Koh, Young Hee**, Ph.D. *University of Pittsburgh*, 1982. 161pp.

The purposes of this study were to: analyze cognitive functioning in Korean middle school students; validate the connection between brain function and curriculum; and confirm whether there are environmental or sex differences in cognitive function.

The null hypotheses for this study were as follows: (1) There will be no significant difference in achievement scores of school subjects between students with right and left dominance on tests of cerebral hemispheric specialization; (2) There will be no correlation between right hemisphere functioning and school achievement of students in art and music; (3) There will be no correlation between left hemisphere functioning and school achievement of students in language, English, mathematics, and science; (4) There will be no sex differences in the pattern of cognitive functioning of Korean middle school students as measured by the *Cognitive Laterality Battery*, *Your Style of Learning and Thinking*, and *Symbol-Digit Modalities Test*; (5) There will be no differences between rural and urban environment in the pattern of cognitive functioning of Korean middle school students as measured by the above mentioned instruments. (6) There will be no differences between Korean and American middle school students in the cognitive profile as measured by the *Cognitive Laterality Battery*.

The instruments were administered to 1,000 Korean middle school students and 187 American middle school students. An analysis of data resulted in the following: (1) Hypotheses one and six were rejected; (2) Hypothesis two was accepted in music; rejected in art; (3) Hypothesis three was rejected in the results as measured by the CLB and SDMT; and accepted as measured by the SOLAT; (4) Hypothesis four was rejected and accepted according to the instrument used; (5) Hypothesis five was accepted on the basis of brain preference, and rejected for brain performance.

### THEORETICAL STUDY, DEVELOPMENT, AND CONCEPT VALIDATION OF A MICROCOMPUTER LITERACY CURRICULUM FOR THE INTERMEDIATE GRADE (4-6) STUDENT Order No. DA8321144

**Koontz, Patricia M. Yourst**, Ph.D. *Kent State University*, 1983. 143pp. Director: James W. Heddens

The dual purposes of this study were: (1) the development of a microcomputer literacy curriculum for intermediate grade students based on logical sequence and pedagogical/psychological theory, and (2) the construct validation of the hypothesized concept hierarchy using a jury of nationwide computer education experts.

A hierarchical concept cluster checklist and flowchart were developed utilizing Gagne's task analysis model and applying psychological development principles, in particular, those of Piaget.

The construct validation procedures started with a pilot study concerned with improving the clarity of the materials to be sent to the jury. The materials included a concept cluster checklist, flow-chart, and a two-part questionnaire. The first part of the questionnaire queried the psychological/pedagogical and sequential soundness of the hierarchy. The second part was a self-rating census concerned with the qualifications of the participants to evaluate the hierarchy.

Following the pilot study, the first round was conducted using a jury of 68 computer educators, resulting in a 67.8% return. Census results indicated the jury to be experienced and knowledgeable in the computer literacy field for the intermediate grade level. The computer literacy hierarchy was moderately supported in round one.

A hierarchy revised on the basis of round-one responses was returned by 87.5% of the round-two jury and received substantial support. The resulting hierarchy consisted of nine concept clusters as follows: (1) Fundamental Concepts, (2) Uses of Computers, (3) Input, (4) Output, (5) Memory, (6) Communicating with the

Computer, (7) Problem Solving, (8) Graphics, and (9) Computers and Society. Four additional clusters were suggested but further research is needed for their inclusion in a general intermediate grade level computer curriculum. The proposed hierarchy appears useful as an intermediate level concept curriculum and may serve as a guideline for future curricular development in the computer literacy arena.

### FEAR OF SUCCESS, RELATIONSHIP BETWEEN COMPETITORS, AND ACHIEVEMENT PERFORMANCE OF WOMEN Order No. DA8307597

**Kronberger, Carlos Vladislao**, Ph.D. *Columbia University*, 1982. 195pp.

The purpose of this study was to examine the relation between fear of success, competition between related and unrelated pairs, and the achievement performance of women in math and verbal tasks. It was hypothesized that there is an interaction between fear of success and related competitors such that women with high fear of success will do better in math if competing against unrelated as opposed to related men; it was also hypothesized that high fear of success women will perform better working noncompetitively with women than competitively against men.

The study was prompted by Horner's (1974) theory and revised scoring system of motive to avoid success (Horner, Tresemer, Berens and Watson, 1973). This investigation also examined the divergence between Horner's model, which considers fear of success as a "women's" achievement motive and the neurotic fear of success theorists (Canavan-Gumpert, Garner, and Gumpert, 1978), who reject the idea of sex differences in fear of success.

Subjects for the study were 82 undergraduate dating couples from four colleges in New York. Horner's projective measure and Cohen's (1974) self-report scale of neurotic fear of success were used to assess fear of success. The experiment consisted of: (1) noncompetitive pretest, in which subjects were separated by sex and tested on math and verbal ability, (2) Individual success feedback and random assignment into related, unrelated cross-sex or unrelated same-sex competitive conditions, (3) Posttest pairwise competition for monetary incentives on equivalent math and verbal tests.

The results did not confirm the hypotheses. There were no sex differences in motive to avoid success or performance measures; data for males and females indicated that high motive to avoid success subjects did better than lows in verbal posttesting, the reverse of expectations. Conversely, there was an interaction between neurotic fear of success and competitive condition on verbal tasks: high neurotic success fearers did better in the related condition than in the unrelated condition.

As these results contradict fundamental assumptions of Horner's model, it is concluded that there is no empirical support for the notion that fear of success is an explanatory construct for women's achievement motivation.

### EFFECTS OF DESEGREGATION ON ACHIEVEMENT, ATTITUDES, AND BEHAVIOR OF URBAN ELEMENTARY SCHOOL CHILDREN Order No. DA8321269

**Kushner, Gerald**, Ed.D. *Temple University*, 1983. 121pp.

The purpose of this study was to determine whether busing urban elementary school children for desegregation purposes affects academic achievement, behavior, and student perceptions. A comparison was made between eighty black children who were bused to a school other than their neighborhood school for purposes of achieving desegregation and eighty white children who remained in their neighborhood school.

Three schools in Northeast Philadelphia who met the criterion of having been desegregated for at least two years were selected for this study. All sixth grade students who had attended the desegregated schools for two years were included in the sample population.

The variables used in the study were California Achievement subtests in reading comprehension and mathematics computation, teacher report card grades of basis skills and behavior, and student responses to an attitude questionnaire.

An analysis of the data included T-Tests to see if there were differences in mean scores of the cognitive data in fourth grade and in sixth grade. Analysis of covariance was used to compare the mean scores of the cognitive data from the fourth to the sixth grade. Chi-Square Tests were applied to the responses of the attitude questionnaire.

When the results of the statistical tests were examined, it was found that the white students performed at a higher level than the black students in achievement test scores and in teacher grades, both at fourth grade and at sixth grade. When the cognitive data was examined over a two year period, from fourth to sixth grade, the mean scores of both groups of children declined, although the white students still performed higher than the black students. The mean grade for behavior for white students was "A" and for black students it was "B".

A review of the responses on the attitude questionnaire revealed that children of both races felt that they get along better with children of the opposite race, there are less discipline problems, better school work is done, and parents prefer if they are enrolled in a mostly white class. The white students agree more strongly. All students feel that teachers of both races treat them fairly and that they are happiest attending school with children of different races.

### EXCUSING ELEMENTARY STUDENTS FROM REGULAR CLASSROOM ACTIVITIES FOR THE STUDY OF INSTRUMENTAL MUSIC: THE EFFECT ON SIXTH-GRADE READING, LANGUAGE, AND MATHEMATICS ACHIEVEMENT Order No. DA8228802

**Kvet, Edward Joseph, III**, D.M.E. *University of Cincinnati*, 1982. 290pp. Chairman: Warren E. George

The primary purpose of this study was to ascertain whether excusing elementary school students from regular classroom activities for the study of instrumental music affects sixth-grade reading, language, or mathematics achievement. The general setting for the study was a major midwestern metropolitan area. Four public school districts which excuse elementary school instrumental music students from regular classroom activities were used in the study. These districts were selected on the basis of differences in size, socioeconomic level (SES), setting, and racial composition, as well as similarities in the organization of the elementary instrumental music programs.

A single-sample multivariate matched-pairs design was employed. The total population of the study was 2,167 sixth-grade students in 26 elementary schools during the academic year 1980-81. Instrumental and noninstrumental students within each district were matched on the following control variables: sex, race, I.Q., cumulative achievement, elementary school attended, sixth-grade classroom teacher, student absenteeism, SES, classroom behavior, and instrumental music study outside school. This matching procedure yielded a final study sample of 17 matched-pairs in District A, 42 in District B, 71 in District C, and 45 in District D.

Hotellings $T^2$ for correlated samples was applied to the sixth-grade achievement data from the districts individually, and computed with the Finn *Multivariance* program. Results from these analyses indicated that $T^2$ was not significant at the .05 level in all four school districts. Therefore, it was demonstrated that the practice of excusing elementary school students from regular classroom activities has no effect on sixth-grade reading, language, or mathematics achievement.

### AN INVESTIGATION OF THE ABILITY OF FOURTH GRADE CHILDREN TO SOLVE WORD PROBLEMS USING HAND-HELD CALCULATORS Order No. DA8300563

**Langbort, Carol Ruth**, Ph.D. *University of California, Berkeley*, 1982. 234pp.

This investigation examines the role of hand-held calculators in helping children solve word problems. Up to now most calculator studies have not analyzed word problems in depth and word problem

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studies have not utilized calculators. The combination of using calculators while solving word problems, and teaching specific strategies while using calculators, contributes to the uniqueness of this study.

The underlying question is whether children using calculators will be able to solve word problems with larger numbers than they can handle using paper and pencil. Can they focus on conceptual understandings and not be bogged down by complex computations? Can children work with larger numbers even if the barrier of computation is removed by the use of the calculator or does the abstractness inherent in the larger numbers inhibit children from working with them?

One hundred eighty-three fourth graders were the subjects of this investigation. Some were taught Instruction [illegible] I, Computation; some were taught Instruction Unit II, Word Problem[illegible]e use of the calculator varied according to the experimental design. Two tests were used: a computation test, with 8 dependent variables, and the correct answer the single criterion measure; and a word problem test, with 6 dependent variables for each of three criteria: correct operation, correct answer, and correct meaning of the answer. On both tests the problems varied according to the magnitude of the numbers and the complexity of the algorithms. Within each of the four operations there were small number problems and large number problems.

It was hypothesized that there would be no differences between calculator and non-calculator groups. The data was analyzed separately for low and high ability groups. The results differed, depending upon the ability level of the students, the level and operation of the problems and the instruction unit that was taught. The results of this study suggest many areas for further research, especially an exploration of the usefulness of calculators with children of low ability.

## THE EFFECTS OF A PLACEMENT TEST TO COUNSEL STUDENTS IN PRECALCULUS MATHEMATICS REGISTRATION Order No. DA8322666

LARKIN, MARTHA ANN, ED.D. *Brigham Young University*, 1983. 134pp. Chairman: W. Dwayne Belt

The two purposes of this study were to use a mathematics placement test (1) to make a recommendation to each student entering Math 110 (College Algebra and Trigonometry) at Brigham Young University for his placement in (a) Math 100E (Intermediate Algebra), (b) Math 100F (Review of Intermediate Algebra), or (c) Math 110A (Polynomials and Synthetic Division) and (2) to determine if this recommendation had any effect in reducing the failure rate in Math 110A. The placement test instrument (the "Basic Algebra and Advanced Algebra Form A/3B" published by the Mathematical Association of America) was accepted as valid and reliable for these purposes. No significant relationship was found between the student's following the course recommendation and his Math 110A grade. The average Math 110A grade was "B–" for students who did take the placement test and "C+" for students who did not take the placement test. A set of four predicting functions was found which correctly predicted 82% of the students Math 110A grades but predicted passing grades (456 of 504 students) better than failing grades (48 of 112 students). It was concluded that the placement test did help reduce the failure rate in Math 110A. It was recommended that students entering Math 110 be required to take the placement test.

## AN INVESTIGATION OF THE EFFECTIVENESS OF AMPLIFICATION AS A VIABLE METHOD FOR IMPROVEMENT OF LANGUAGE AND ACADEMIC ACHIEVEMENT IN A NOISY ENVIRONMENT Order No. DA8317573

LEWIN, RENEE ZELAC, ED.D. *Loyola University of Chicago*, 1983. 103pp.

This field experiment was designed to investigate the effectiveness of amplification as a viable method for the improvement of language and achievement in a noisy environment.

Amplification techniques have been utilized successfully in Project MARRS (Mainstreaming Amplification Resource Room Study) for approximately six years for the purpose of remediating educational deficits in students with minimal hearing losses. In the present study, three classes (one fourth, one fifth, and one sixth grade class) were selected as intact experimental groups receiving the amplification treatment condition. In addition, three comparable classrooms (in terms of students at the same grade level) were carefully selected to serve as control groups receiving no amplification treatment. All students in both the experimental and control groups were individually administered the Clinical Evaluation of Language Functions (CELF) Test at the beginning and at the end of the school year. Subtest results of teacher administered group achievement tests (Stanford Achievement Test) for previous and present grade levels were also included as additional dependent variables. Results indicated that there was no statistically significant difference between the experimental and control groups performance scores on the language scale (Clinical Evaluation of Language Functions). Furthermore, there was no statistically significant difference between the experimental and control groups performance scores on the achievement scale (Stanford Achievement Test).

However, performance differences across grade levels was statistically significant in terms of language production and language total test scores on the Clinical Evaluation of Language Functions (CELF) Test and on the vocabulary, math, and listening subtests of the Stanford Achievement Test (SAT). The overall findings of this field experiment indicated that amplification was insufficient as a treatment effect in producing statistically significant differences across groups.

However, the negative findings reported here do appear to be powerful, indicating that amplification, utilized as a generalized treatment condition, does not appear to be a viable method for the improvement of language and achievement in a noisy environment.

Finally, an overall explanation related to increased arousal and habituation to noise utilizing a combination of components form three theoretical interpretations of an individual's adjustment to noise (Broadbent, Cohen and Poulton) was offered in support of the findings of this field experiment.

## THE EXTENT TO WHICH GROUP INSTRUCTION SUPPLEMENTED BY MASTERY OF THE INITIAL COGNITIVE PREREQUISITES APPROXIMATES THE LEARNING EFFECTIVENESS OF ONE-TO-ONE TUTORIAL METHODS

LEYTON SOTO, FERNANDO, PH.D. *The University of Chicago*, 1983.

The major purpose of the research was to develop a group instruction method which is as effective as a one-to-one tutorial method, and, to determine the extent to which cognitive and affective outcomes of learning are affected by the learning conditions provided to students. Four different group learning conditions were used: (a) enhanced initial cognitive entry behavior plus mastery learning, a maximal group instruction, (b) coventional group instruction, a minimal quality of instruction, and two intermediate qualities of instruction, (c) mastery learning, which used the feedback-corrective procedure, and (d) conventional group instruction plus enhanced initial cognitive entry behaviors.

Two studies were conducted in two different content areas. In each, ninth grade students were randomly assigned to each of the four different learning conditions. A sample of students was taught French as a second language; another sample was taught algebra.

The results indicate that the achievement attained, attitudes acquired toward themselves as learners including relations between prior and subsequent achievement are strongly determined by the learning conditions provided. T[illegible]verage students in the maximal learning conditions groups was above 95% of the students in the conventional group.

The implications of this study are (a) group-based instruction can be as effective as tutorial instruction when initial cognitive entry behaviors and feedback-corrective are properly applied in a group setting, (b) students can be similar in level of achievement when learning conditions are properly designed to meet their learning needs, and, (c) students' learning potential is most fully revealed under the best set of conditions such as enhanced initial cognitive entry behaviors plus mastery learning. It is not adequately expressed under conventional instruction or by prior measures of achievement.

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### ATTRIBUTIONS OF PERFORMANCE AND EXPECTANCIES FOR SUCCESS: SELF-PERCEPTIONS OF GIFTED ADOLESCENTS DURING MATHEMATICAL CONCEPT DEVELOPMENT

Order No. DA8229073

LILLY, MARSHA WEISS, ED.D. *University of Houston*, 1982. 183pp.

*Purposes*. This research explored how gifted adolescents form attributional judgments and develop achievement-related expectancies in the context of mathematical concept development. One focus was to determine whether attributional and expectancy judgments differ as a function of students' level of school achievement. A second focus was to investigate whether such self-perceptions vary according to sex.

*Procedures*. Subjects were 100 students drawn from grades 6 through 8 in four middle schools, and were predominantly middle class. The 50 males and 50 females had previously been identified by the school district as academically gifted. Within sex, half of the students were classified as achievers and half as underachievers.

The students' attributional and expectancy judgments were measured through the use of the *Lilly Attribution-Expectancy Assessment* administered within the context of a self-instructional learning module on the mathematical topic of residues. This instrument allowed students to periodically assess their ability, task difficulty, effort, general expectancy, and perceived efficacy.

*Results*. Data were analyzed using a 2 (Level of Achievement) x 2 (Sex) analysis of variance with five repeated measures (Trials). Skill performance among the gifted achievers was not significantly different, yet when compared with female gifted achievers, male gifted achievers perceived their ability, general expectancy, and perceived efficacy judgments consistently higher across trials. Even though there were statistically significant ($p < .05$) differences on measures due to Sex, the findings suggest that Level of Achievement was a more statistically significant ($p < .01$) influence on academic self-perceptions. Regardless of sex, students with lower achievement held lower perceptions of their ability, felt less confident about succeeding, judged the task as more difficult, and felt they had to work harder, compared with students showing higher school achievement. The fact that a novel task was employed suggests that self-perceptions formed through school experiences may generalize to new learning situations.

### A SELF-EFFICACY ANALYSIS OF THE EFFECTS OF REFLECTIVE-IMPULSIVE CONCEPTUAL TEMPO ON CHILDREN'S MATHEMATICS COMPUTATION SKILLS

Order No. DA8309634

LINDSKOG, CEDERICK O., ED.D. *Ball State University*, 1982. 69pp.
Chairman: Dr. Kenneth L. Joy

The general purposes of this study were to investigate relationships between tutoring style and self-efficacy, as well as relationships between self-efficacy and self-efficacy ratings. The specific purposes of the study were to investigate the relationship between Participant Modeling and Didactic treatments on self-efficacy ratings, as well as the relationship between self-efficacy and subsequent math computation performance. In addition to investigating these factors, their effects relative to the particular cognitive style of the students was measured.

There were 75 subjects whom participated in the study. Permission slips were sent to 183 fourth graders in the three participating schools. A total of seven classes were involved. Permission slips were returned by 109 children, all of who were administered the MFFT. The median split procedure was used to classify the children into two groups, 34 impulsive, and 41 reflective. The children were randomly assigned to one of two treatment groups or a control group.

Three levels of tutoring comprised the active independent variable and two levels of conceptual tempo made up the independent attribute variable. Data were processed for 75 of the original 77 subjects, as two were lost due to attrition. The research design utilized was a 3 x 2 fixed effects factorial design. The final hypothesis was measured by a Pearson Product Moment Correlation utilizing the Fisher Z statistic.

*Conclusions*. Analysis of the data revealed that there was a significant relationship between self-efficacy ratings for 1D problems and treatment type. Both the participant modeling and didactic treatment groups showed significant main effects at the .05 level. The treatment effects did not reach significance at the 2D and M2D difficulty levels.

There were no significant relationships between the reflective-impulsive conceptual tempo and persistence regardless of difficulty level. This indicates that conceptual tempo is probably not a factor with regard to persistence in problem solving and is not related significantly to this aspect of self-efficacy theory.

Finally, the data analysis revealed that self-efficacy ratings were not reliable predictors of subsequent math computation performance regardless of difficulty level or conceptual tempo.

### A FACTOR-ANALYTIC STUDY OF MATHEMATICS ANXIETY

Order No. DA8226901

LING, JEANNE LAN, ED.D. *Virginia Polytechnic Institute and State University*, 1982. 86pp.

The purpose of this study was to investigate student attitudes towards mathematics and mathematics anxiety. In the past, mathematics anxiety has been measured by using different instruments and characterized as a unidimensional construct. However, prior studies concerning mathematics anxiety have not established construct validity of the scales used. This study was designed to establish the construct validity of the scales used to measure mathematics anxiety and to investigate the possibility that it may be a multidimensional construct.

A series of self-report questions and survey instruments was administered in 17 freshmen college mathematics classes containing 491 students. Eight instruments were selected, namely:
(1) Usefulness of Mathematics, (2) Test Anxiety Inventory,
(3) Mathematics Anxiety, (4) Adjective Check List, (5) Short-form Dogmatism, (6) Attitude Toward Success in Mathematics,
(7) Effectance Motivation in Mathematics, (8) Confidence in Learning Mathematics.

Factor analysis techniques were used to treat the data: (1) To analyze the scores from the eight tests and reduce the responses to six principal factors which describe the nature of mathematics anxiety. (2) To determine the strength of the relationship of these attitudes to sex, socioeconomic status, college curriculum, high school mathematics background, college grade point level and achievement in current mathematics courses.

The results suggest that mathematics anxiety is a unidimensional construct related to students' attitude towards mathematics more than to their personality characteristics. A finding contrary to the literature was that females did not suffer mathematics anxiety more than males.

Recommendations arose from consideration of which attitudes in the mathematics anxiety complex were potentially modifiable by educators. It was recommended that schools actively seek to improve these attitudes. It was also recommended that females be encouraged to success in mathematics and that colleges seek to identify and help entering students who exhibit mathematics anxiety.

### THE EFFECT OF CONCEPT INSTRUCTION ON STUDENTS' ABILITIES TO APPLY ALGORITHMS TO SOLVE MATHEMATICS PROBLEMS

Order No. DA8319300

LIU, JEANNE M., PH.D. *University of South Carolina*, 1983. 245pp.

The purpose of this study was to determine the effects of concept instruction and non-verbal academic aptitude on students' abilities to directly apply an algorithm to instructionally-similar exercises and to solve verbal mathematics problems, a problem type which was not encountered during instruction. Based on a model which represents relationships between the functions of conceptual knowledge and problem solving process components, the study was conducted to test a portion of the model which proposed that knowledge of the concept denoting an algorithm appropriate for solving a problem helps the student conceptualize the problem. Instruction involving this type of concept was hypothesized to enhance students' abilities to solve problems, but not their abilities to directly apply the algorithm

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since conceptualization of the problem is not required for this level of application.

Students in eight seventh grade mathematics classes in Columbia, South Carolina, were randomly assigned to one of two instructional treatments. Half of the students received instruction involving the concept of area and algorithm instruction on finding the area of complex rectangular shapes, while the other half of the students received only algorithm instruction. Instruction was provided through programmed materials. Pretest and posttest achievement measures constructed by the investigator were also administered.

Results of the study indicated that the presence of concept instruction did not enhance students' abilities to directly apply the algorithm or to solve problems. However, mastery of the concept denoting the algorithm did have a significant effect on both direct application performance ($p < .001$) and problem solving performance ($p < .001$). In addition, non-verbal academic aptitude significantly affected both direct application ($p < .001$) and problem solving performance ($p < .001$). Significant differences favoring the medium and high aptitude students were found for direct application performance, while differences favoring high aptitude students were found for problem solving performance. Aptitude-treatment interaction effects were not statitically significant.

## AN ANALYSIS OF THE RELATIONSHIP BETWEEN THE MATHEMATICAL COMPETENCIES REQUISITE TO EMPLOYMENT AND TO SATISFACTORY JOB PERFORMANCE IN CERTAIN MATHEMATICAL PROFESSIONS

Order No. DA8313374

LOASE, JOHN FREDERICK, ED.D. *Columbia University Teachers College*, 1983. 100pp. Sponsor: Professor Bruce Vogeli

The purpose of this study was to explore the relationship between mathematical competency and occupational suitability in certain mathematical professions. Actuarial science and computer science were selected as the foci for the inquiry. Three levels were considered with each occupation based upon whether the specialist was a low level practitioner (Level I), manager (Level II), or high level professional (Level III).

A survey instrument and cover letter were created to ascertain formal mathematical preparation of the professionals together with the frequency and importance of 69 salient mathematical topics from the high school and collegiate mathematical curriculum. A sample of two hundred forty actuaries and two hundred forty computer scientists were mailed the survey instruments. After two mailings the final response rate was 40% with over 92% reliability within the six occupational categories. A correlation of .95 between median frequency and median importance of the 69 mathematical topics permitted the exclusive consideration of frequency in the statistical analyses.

An analysis of variance concluded that for the actuarial profession there was a significant difference among the three levels in formal mathematical backgrounds yet no significant difference in the mathematical demands of the job among the three levels. For the computer scientist there was no statistically significant differences among mean coursework or mean job demands among the three levels.

Eight correlation coefficients were computed between frequency of use of the mathematical topics and formally completed coursework, separate correlations for Levels one, two, three, and overall within each occupation. Each result was non-significant within the actuarial field except for an overall industrial correlation. All of the correlations were significant within the area of computer science except at the entry level.

In both occupations the use of elementary arithmetic was daily or weekly for practitioners at every level. Topics from algebra were frequently encountered on the job but not as frequently as elementary arithmetic.

The vast majority of topics from collegiate mathematics and beyond were very rarely used by the actuarial or computer scientists.

## THE INFLUENCE OF SCHOOL BUILDING DESIGN AND INSTRUCTIONAL STYLE ON TITLE I FIRST-GRADE MATH ACHIEVEMENT SCORES IN THE DISTRICT OF COLUMBIA PUBLIC SCHOOLS

Order No. DA8315345

LONG, LYNNE GREER, ED.D. *The George Washington University*, 1983. 142pp. Director: Dr. Edward Lilly

The purpose of this study was to determine the effect of open (O) or traditional (T) instructional style (IS) by the mathematics resource teacher, and open (O) or traditional (T) school building design (BD) on the mathematics achievement gain of Title I first-graders in the District of Columbia Public Schools. Instructional style was determined by the subject teachers' scores on the Dimensions of Schooling Questionnaire (DISC V) by R. E. Traub et al.; school building design by observation and official confirmation; and math achievement gain by pre- and posttesting of the subject students, in October 1980 and April 1981, respectively, on the Comprehensive Test of Basic Skills.

The interactions of the instructional style and building design variables and their possible association with the mathematics achievement gain of the subject students during the targeted school year was tested by simple comparisons of the mean gain scores for the discrete subgroups of the sample delineated by each of the two values for each of the two independent variables (instructional style and school building design) and by the four possible combinations of values between these two variables. Both unweighted means, for schools, and weighted means, for students, were derived.

The highest mean gain score (unweighted or weighted) was gotten by students having traditional IS in a traditional BD; the lowest (unweighted or weighted) was gotten under open IS in an open BD. Traditional BD with either IS or for the entire sample (both IS's) was associated with greater mean gain scores than any one of the other BD's. Open IS faired better than open BD, but only in combination with traditional BD or with all three BD's taken together. Traditional IS faired better with open or mixed BD than did either open or mixed BD considered for both IS's. Open and mixed BD figures near the bottom of the same scale. Open BD figured near the top of the scale only in combination with traditional BD.

Based on the results of this study, it is recommended: (1) that the traditional IS and BD be favored over the open for the best math achievement for Title I first-graders in the DCPS; (2) that traditional characteristics of IS should be fostered by specific staff development objectives; and (3) the results of such studies as this be seriously considered by DCPS Title I administrators in the implementation of their program objectives.

## COLLEGE SCIENCE STUDENTS' PERCEPTIONS OF THE VALUE OF HIGH SCHOOL MATHEMATICS INSTRUCTION IN PREPARING STUDENTS FOR FRESHMAN COLLEGE SCIENCE

Order No. DA8317133

LUISSEH, THOMAS ROBERT, ED.D. *Lehigh University*, 1983. 208pp.

The study is an examination of college chemistry majors' perceptions of the v[illegible] of high school mathematics instruction in preparing students [illegible]ege science. Fifty students recommended by professors of Leh[illegible] University's Departments of Biochemistry, Chemical Engineering, and Chemistry, participated in the study.

The method of gathering data was by taped interview using a schedule of twenty-eight questions. Participants were asked specific questions related to their high school preparation in mathematics, and the value of that preparation when mathematical knowledge was needed for their college science studies. Respondents were asked to describe specific experiences that would substantiate their evaluations.

The value of high school calculus was consistently ranked as number one in all questions related to mathematics course value and applicability. Ninety-four percent of the sample recommended calculus as a course students should have for college. The course that was perceived as the most valuable high school science course source of the mathematics knowledge was chemistry. Seventy percent of the sample ranked it above all other high school science courses.

When asked if any other high school courses were of value in preparing one for college science, sixty-eight percent listed English writing as most valuable.

Four recommendations were made in this study. First, that high schools readjust their programs to provide college preparatory students planning to study science in a college program similar to Lehigh University's, with at least one course in calculus. Second, that high schools do not reduce the offerings of mathematics or science presently existing in their curricula. Third, that high schools recruit knowledgeable teachers to prepare students for college, and design the course curricula to be demanding upon the high school college preparatory students to a level of difficulty approaching that of a college level. Fourth, that high schools expand instructional requirements in the area of English writing skills.

## THE EFFECT OF SCHOOL EMPLOYEE STRIKES ON STUDENT ACHIEVEMENT IN NINE OHIO SCHOOL DISTRICTS

Order No. DA8321147

**Lulow, Roger James,** Ph.D. *Kent State University*, 1983. 102pp.
Director: Pat E. Crisci

The purpose of this research was to determine what impact, if any, teacher strikes and the resulting loss in instructional time to students, would have upon student achievement in reading and mathematics achievement. The study focused on five areas: (1) To determine if school employee strikes negatively affect reading and mathematics achievement of sixth grade students; (2) to determine whether a strike of 14 or more days has a greater negative impact upon mathematics achievement than a strike of less than 14 days; (3) to determine whether a strike of 19 or more days has a greater negative impact on reading achievement than a strike of less than 19 days; (4) to ascertain whether average, below average, or above average students who do not attend school during a strike are affected differently as a group of students when they do not attend school during a strike; and (5) to determine if the presence of a substitute teacher in place of the regular teacher during the strike has an impact on student achievement.

For the 184 students in this sample, the analysis does not support the conclusion that for sixth grade students a strike affects either their reading or mathematics achievement. The data on the entire sample do not support the conclusion that average students are affected differently from either above or below average students.

When the set of student scores is divided into those from districts with strikes of less than or more than 14 days, the results on mathematics achievement are different. While student scores from districts in both sets exhibit the same pattern as the sample as a whole, the presence of the regular teacher during the strike does have a statistically significant impact on mathematics achievement.

When reading scores are analyzed by dividing the sample into student scores from districts with strikes of less than or more than 19 days the analysis does show that reading scores are impacted by a strike of 19 or more days. No other independent variables are statistically significant. Hence, the conclusion that the presence of the regular teacher will not affect reading achievement in either a short, long or very long strike.

## THE RELATIONSHIP BETWEEN AVERAGE STUDENT ACHIEVEMENT AND NONPROMOTION RATE: A PATH ANALYSIS MODEL FOR NORTH CAROLINA ELEMENTARY SCHOOLS

Order No. DA8315647

**Maddocks, John Calvin,** Ed.D. *The University of North Carolina at Greensboro*, 1983. 105pp. Director: Dr. Donald W. Russell

This research examines the relationship among initial elementary school achievement, nonpromotion, and subsequent academic achievement. School-wide achievement means and retention rates were examined for first-, second-, and third-grade classes across North Carolina. In addition, the factors of race, socioeconomic status, and intelligence were examined as correlates of achievement means and nonpromotion rates and their linear effects were controlled in the analysis. This research analyzes the effects of differing rates of nonpromotion upon classes of children in several grades rather than the effects upon individual children who are either promoted or retained.

A review of previous research was conducted and these findings were compiled into an hypothesized path-analysis model. This model proposed a relationship among several variables, indicated causal links, and arranged them in temporal order.

Data were collected from three agencies of the North Carolina Department of Public Instruction and from nine local school administrative units across the state. Regression analysis was performed and the resulting standardized coefficients entered in the model as path coefficients. A replication of the reading achievement model was performed using math achievement data. Both models were reduced to a parsimonious form and these forms were examined for reasonableness. The stability of the data was examined for the three years under investigation.

The results support the contention that, on average, schools which retain a higher percentage of pupils in the first grade demonstrate higher mean achievement in the second grade. However, the magnitude of the effect is relatively small. First-grade achievement has almost three times the direct effect upon second-grade achievement as that of first-grade nonpromotion. The effect of nonpromotion on subsequent achievement was not confirmed beyond the second-grade level. Race and socioeconomic status has no effect upon school mean achievement or on non-promotion rates, except through their significant correlation with intelligence test scores. Separate models for reading and math achievement were found to be reasonably similar. The data were found to be stable during the period of investigation, and representative of the population of North Carolina public schools.

Unexamined school-wide and teacher variables appear to affect the rate of nonpromotion. Future replications of this study should examine these factors, as well as expand the scope of investigation to include intermediate and secondary grades.

## HOMEWORK AND SOCIAL FACILITATION THEORY IN TEACHING ELEMENTARY SCHOOL MATHEMATICS

Order No. DA8314475

**Marshall, Patricia McGinn,** Ph.D. *Stanford University*, 1983. 251pp.

A meta-analysis of 21 experimental studies of mathematics homework yielded an average effect size of −.1 for computation achievement and +.3 for problem solving achievement, indicating that homework may not benefit computation achievement. The purpose of this dissertation was to determine whether the meta-analysis technique would yield results that could be replicated experimentally. In addition, a theoretical explanation of the meta-analysis results using Zajonc's (1965) theory of social facilitation was attempted.

Two nearly identical small-scale experiments (N = 9 classes; N = 12 classes) were carried out in grades five and six. The experiments used a pretest-posttest-retention test control group experimental design. The three treatments were (1) computation homework, (2) word-problem homework and (3) classwork only (control). In order to control for time-on-task, the classwork treatment received "homework" three times per week to be completed in class outside of the normal math period. The experimental results concurred with the meta-analysis results in indicating that homework is beneficial for problem-solving achievement but not for computation achievement although the word-problem posttests indicated a possible aptitude-treatment interaction in that low ability math students may benefit more from homework and high ability math students may benefit more from classwork.

Zajonc's (1965) theory of social facilitation, which states basically that a person learns best alone, fell short in explaining the social conditions under which simple tasks such as computation are learned. Also, statistically significant correlations between group size and achievement were negative for the homework treatments (which ranged from 0 to 6 people present) and were positive for the classwork treatments (which ranged from 13 to 34 people present). These results indicate that an improvement to Zajonc's theory would have to account for the learning that takes place in groups.

### CONCEPTS OF EUCLIDEAN GEOMETRY: THEIR RECALL FROM VERBAL AND VISUAL MEMORIES Order No. DA8302264

**Martell, Vivian Marie**, Ph.D. *The University of Florida*, 1982. 165pp. Chairperson: Mary Grace Kantowski

This study was designed to investigate what factual and conceptual knowledge is recalled by students who have completed a course in high school geometry. Question stems served as stimuli to which students had to produce a response. Thirty-eight items were presented both verbally and figurally and included the areas of rigid motion or triangular items, dilation motion or items on similarity and parallelism, circles and their properties, and formulae. The data were taken from the Prerequisite Facts Test (PFT) that was composed and utilized by the staff of the Geometry Problem Solving Project (GPSP), NIE-G78-0225. The questions on this instrument represented the conceptual knowledge contained in a high school geometry course and included the necessary definitions and theorems to solve the problems given in the problem solving phases of the Project.

Since repeated measures were observed on each student a split plot design/analysis of variance was utilized. Data obtained on 240 students from nine high schools in four different regions of the United States were analyzed by SAS, SPSS, and BIOMED programs. The General Linear Models option produced analyses of variance and regression equations for both the total population sampled and the population scoring in the upper quartile on the Prerequisite Facts Test.

Statistical analyses revealed that students, overall, recall the least information on circular items and that the figural presentation of the question stems elicits more correct responses than the verbal presentation. A mode by content interaction was observed for the total population but not for the population scoring in the upper quartile. This population recalled information equally in both modes of presentation. Both populations recall the most information on rigid motion or triangular items.

The Prerequisite Facts Tests and problem solving protocols of 16 students, whom the investigator interviewed directly, were examined to generate hypotheses for future research related to accuracy of recall, metacognitive responses, and success in problem solving.

### ORGANIZATIONAL CLIMATE AND STUDENT ACHIEVEMENT IN MATHEMATICS Order No. DA8321573

**Martin, Mary Jo**, Ed.D. *Duke University*, 1983. 129pp. Co-Supervisors: Robert A. Pittillo, Jr., Richard H. Leach

*Purpose*. Student achievement and its relationship to the structure of educational organizations has been and still is an enigma. Organizational climate has been suggested as a variable which contributes to achievement. The purpose of this study was to examine the relationship between mathematical achievement test scores and organizational climate.

*Methodology*. The students, teachers, and administrators of selected schools in an administrative unit in North Carolina participated in the study to ascertain whether there was a relationship between organizational climate and mathematics achievement. The Organizational Climate Description Questionnaire and the California Achievement Test were used.

The OCDQ was administered to the teachers and administrators of the schools. The schools were then placed on a continuum ranging from Open to Closed.

Measurement of the dependent variable was achieved by use of the California Achievement Test. Grades three through nine were the sample population.

An analysis of covariance using the intelligence test scores as the covariant was used to test the hypotheses. The independent variable was organizational climate; the dependent variable was achievement scores.

*Findings and Conclusions*. Statistically significant *F*-values at the .05 level were obtained by the analysis. Further analysis by use of the *t*-test revealed significant differences between the more Open and more Closed schools at some grade levels. These significant values that were derived indicated a relationship worthy of further scrutiny.

The study did not unequivocably support the contention that mathematical achievement and organizational climate varied consistently at each grade level. However, particularly high subtest scores such as those for Esprit did produce consistent variations. Thus the study does lend support to the contention that significant relationships exist between organizational climate and mathematics achievement scores.

*Recommendations*. Since the results obtained on this rural, small-town school population reflected significant *F*-values and in some cases significant *t*-test values, other studies of similar but larger populations need to be conducted. Attention should be given to applying multiple regression techniques. Such an approach might yield more concrete information about the relationship between organizational climate and student achievement.

### THE RELATIONSHIP OF STUDENT SELF-CONCEPT TO ACHIEVEMENT IN READING AND MATHEMATICS AND TIME OFF-TASK Order No. DA8216254

**Martin, Michael Kemp**, Ph.D. *The University of Wisconsin - Madison*, 1982. 153pp. Supervisor: Professor Richard A. Rossmiller

The purpose of this study was to examine the relationship of student self-concept to student use of time and academic achievement in reading and mathematics over a two-year period. The theoretical framework for the study was based on the results of previous research involving (1) theories of self-concept, (2) academic achievement, (3) teacher-pupil interaction, and (4) individualized instruction.

Data were collected on 204 students in four Wisconsin elementary schools. Students were observed during their third- and fourth-grade years by a research team. Each school was visited three times during each of the two years. Four sets of data were collected: student self-concept scores, reading and mathematics achievement scores, and classroom observations of student time spent off-task.

The research question was stated in the form of three hypotheses. Each hypothesis was analyzed statistically using a stepwise multiple regression technique. Pearson product-moment correlations were also calculated for each hypothesis. The probability level for all tests of statistical significance was set at .05.

Findings and conclusions derived from the analysis of the data included: (1) The regression of students' change in self-concept scores against change in their reading achievement scores revealed a statistically significant relationship. Two independent variables--teacher affiliation and social maturity--demonstrated a statistically significant relationship with change in reading achievement in the final equation. (2) A statistically significant relationship was established between change in student self-concept and change in student mathematics achievement scores. Teacher affiliation and social maturity emerged as statistically significant independent variables in the final regression equation. (3) No significant relationship was established between change in student self-concept and change in student off-task time. (4) The self-concept variable social confidence was a useful predictor of student's achievement in reading and mathematics and their off-task time.

Based on these conclusions, implications for future research and practice were suggested.

### PRETRAINING HISPANIC STUDENTS ON TEST-TAKING STRATEGIES AND ITS EFFECTS ON THE RELIABILITY AND PREDICTIVE VALIDITY OF A MATHEMATICS PREDICTOR TEST Order No. DA8321406

**Maspons, Maria Mercedes**, Ph.D. *University of Miami*, 1983. 84pp. Supervisor: Professor E. J. Kleinert

*Purpose*. The purpose of this study was to investigate the extent to which the training of Hispanic students in test-taking influences the psychometric properties of a test. It sought to discover the effects of the test-taking training on the reliability of internal consistency and predictive validity of a mathematics predictor test.

*Design*. The sample consisted of 803 entering college students. Of these, 535 were Hispanic. From this sampling of Hispanic students, 241 had completed most of their education in the United States and had prior familiarity with multiple-choice tests. The remaining 294 students had received most of their education outside of the United States and were unfamiliar with the multiple-choice format. The students were randomly assigned to the experimental or control group. Students in the experimental group were instructed in test-taking skills. Control subjects received information on the college's programs for an equivalent period of time. All subjects in the experimental and control groups were administered the mathematics portion of the College Guidance and Placement (CGP) test. Based on the results of the predictor, subjects were placed in either a Basic Skills or an Algebra Course. A total of 218 subjects completed the courses.

*Findings.* Results showed slightly lower internal consistency estimates for the experimental groups and a moderate increase in predictive validity for experimental subjects. The increase reached significance at the .05 level for those Hispanic students educated in the United States, and for Hispanic students in general in the Basic Skills course. It was significant at the .05 level for Hispanic students in general in the Introductory Algebra course.

*Conclusions.* The results of the study indicate that Hispanic students can profit from a short training in these skills. They also indicate that the psychometric properties of the instruments used to evaluate Hispanic students may be improved by training provided to the students. These results are important to anyone involved with the education, placement, and admission to programs, colleges, and universities of Hispanic students.

## AN INVESTIGATION INTO MIDDLE SCHOOL STUDENTS' KNOWLEDGE OF TEXTBOOK METASTRUCTURE

**Order No. DA8308190**

**MATEJA, JOHN ANDREW, PH.D.** *University of Georgia*, 1982. 242pp. Director: John E. Readence

This study attempted to provide answers for two questions. The first involved finding the relation between students' levels of knowledge of textbook metastructure and other measures of functioning. The second sought to discern the strategies that students possessing different levels of knowledge employed relative to textbook metastructure.

One hundred and sixty-nine sixth grade students were tested in intact, homogeneous, content area classes during normal school hours. Quantitative data were collected relative to students' functioning on measures of textbook metastructure, reading achievement, mathematics achievement, grade point average, days of attendance, attitudes toward school subjects, and mental abilities. Follow-up structured interviews were conducted individually with 12 students to ascertain the kinds of strategies employed in processing textbook metastructure.

Data from the dependent variable and the independent variables were analyzed using a multiple linear regression technique. In a predetermined order, the six variables were entered into the estimated linear equation that was applied to the criterion measure. Results indicated a statistically significant linear relation between cores on the test of textbook metastructure and functioning on other measures. The independent variables accounted for approximately 36% of the variance of the scores on the dependent variable. However, only the achievement variable, i.e., scores on the reading and mathematics subtests, made statistically significant contributions to the prediction of performance on the test of textbook metastructure. A reduced model regression analysis revealed that those two factors accounted for approximately 35% of the variance in the scores on the criterion measure.

Verbal reports from selected subjects were used to describe the cognitive processing strategies relative to textbook metastructure. Students' self-reports indicated the utilization of strategies generally described as being: (1) text-based (concrete), (2) text- and reader-based (concrete and abstract), and (3) reader-based (abstract). Direct relations appeared to exist between students' levels of knowledge of textbook metastructure and students' types of processing strategies. Changes in processing strategies occurred when students experienced difficulties in responding to new information or gained insight from making connections between new and old information.

## THE EFFECTS OF TEACHER PRAISE ON STANFORD ACHIEVEMENT TEST SCORES OF CULTURALLY DISADVANTAGED ELEMENTARY SCHOOL STUDENTS

**Order No. DA8317227**

**MAURER, JOHN VICTOR, PH.D.** *Florida Institute of Technology*, 1983. 112pp.

This study investigated whether massive, consistent, positive reinforcement, disseminated by specially trained teachers over a period of seven months, significantly increased SAT scores of culturally disadvantaged primary level students. A secondary purpose was to examine the relationship between the amount of praise and its effects on student achievement test scores.

The sample population for this study consisted of 339 inner-city Dade County students in grades one through three. These students were selected to receive extensive praise from a group of randomly selected teachers and aides. A control group of 347 students in grades one through three, who were in the same schools, and whose teachers did not receive training in the techniques of disseminating positive reinforcement, was selected to serve as a control group.

The intervention process for the treatment group consisted of the teachers giving students consistent praise for school work over a period of seven months. Project teachers received a one week workshop on the use of techniques for disseminating praise to students. Project evaluators insured utilization of these techniques by frequent on-site visitations.

The instruments used in this study were the Stanford Achievement Test (SAT) and a teacher checklist entitled "Desirable Classroom Behavior for Increasing Self-Esteem" (DCBIS).

The results indicated that overall there was a significant difference at beyond the .05 level between project participants' scores on the Stanford Achievement Test over that of the scores for non-project teachers' students. These results were also evident for the Reading Comprehension, Word Reading, Listening Comprehension, Total Math and Environment subtests of the Stanford Achievement Test. There was also a significant difference at the .05 level in the frequency of use of positive reinforcement by project teachers over that of non-project teachers. There was not a positive correlation between the amount of positive reinforcement and the level of achievement on the Stanford Achievement Test. Therefore, it was concluded that the use of massive praise seems an efficient, inexpensive, convenient and effective means of improving the overall learning and, possibly, the emotional adjustment of culturally disadvantaged primary school children.

## A COMPARISON OF TWO SEQUENCES FOR TEACHING PERCENT

**Order No. DA8304541**

**MAXIM, BRUCE ROBERT, PH.D.** *The University of Michigan*, 1982. 246pp. Chairman: Joseph N. Payne

The purpose of this study was to develop and evaluate two sequences for teaching percent. The two sequences differed in their approach to the solution of case 1 percent problems. One of the sequences relied on the factor product method and the other on the proportion method. The interrelationships among the students' knowledge of fractions, decimals and percents were examined. An author developed model for learning percent problems solving skills was evaluated.

The subjects (N = 278) were derived from eleven, intact, seventh grade mathematics classes from two public schools. All classes were taught by their regular teachers. Classes were randomly assigned to treatments, so that each of the three teachers involved in the study taught about the same number of classes in each treatment. The students received twenty days of instruction and testing. Student learning was assessed using author developed tests and interviews of randomly selected students.

Student test performance in this study exceeded several nationally reported test results. Analyses of variance and covariance revealed few significant differences between treatment groups. Where treatment differences were found they tended to favor the factor product students. Cross-lagged panel correlation analyses indicated that student knowledge of fractions and decimals had a significant effect on their ability to learn percent topics. Walbesser ratios were computed and used to evaluate the author's model for learning percent problem solving skills. Student test data supported the author's model for solving case 2 percent problems, but not for solving case 1 percent problems.

Results of this study suggest that percent work can be introduced at the seventh grade level, but more time needs to be spent on teaching it than has been traditionally allocated for it. A number of topics (writing percent equivalents for thirds and eighths, simplifying fractions, and solving percent verbal problems) were discovered to be very difficult for students to master. Special lessons will need to be developed for difficult topics and there may be some topics, like the solution of percent increase problems, which should be introduced at this level without expecting student mastery.

### AN ANALYSIS OF INDIVIDUALIZED EDUCATION PROGRAM GOALS SELECTED FOR ELEMENTARY SCHOOL LEARNING-DISABLED STUDENTS

Order No. DA8307890

McCormick, Paula Kaplan, Ed.D. *The George Washington University*, 1983. 149pp.

The study provides educators with a conceptual and statistical procedure that can be adapted for use nationwide to analyze the instructional characteristics of the IEP goals of learning-disabled students, as well as students in other special education programs. This study was designed to analyze the types and frequencies of individualized education program goals selected for elementary learning-disabled resource (LDR) and self-contained (LDSC) students in Fairfax County Public Schools, Fairfax, Virginia, and to compare the learning disabilities teachers' assessment of progress made on the goals by these groups of students.

The sample was randomly drawn and included IEPs for 102 LDR and 94 LDSC students from 32 elementary schools. A sub-sample to rate student progress consisted of a random selection of 61 elementary students from the LDR and 62 elementary students from the LDSC samples.

All analyses in this study were completed by using the Statistical Package for the Social Sciences (SPSS) on the Hewlett-Packard 3000 computer.

The SPSS program was used to compute frequency counts of different variables, t-tests, $X^2$ tests, analysis of covariance, stepwise regression analysis, and T-score conversions.

The results indicate that the IEP goals written for learning-disabled students are highly individualized. By analyzing goal frequencies, patterns, categories, and progress, this study demonstrates that the educational programming for each student is developed to match his or her unique learning difficulties. In most cases, goal categories are not associated with a particular program model (LDR and LDSC), and goal progress is not associated with a particular educational ability and achievement level characteristic included in this study.

The frequency of different types of goal categories used in the LDR and LDSC programs varied according to the number of months a student has been enrolled in a special education program and reading and math achievement levels.

The method developed for analyzing IEP goals and students' progress made toward achieving these goals will provide school districts with practical procedures for planning and evaluating their programs by using IEP data.

### FIRST-GRADERS' PERFORMANCES ON SUBDIVISION TASKS INVOLVING DISCRETE AND CONTINUOUS MATERIALS

Order No. DA8319644

McDermit, Sharon Anne, Ph.D. *The University of Texas at Austin*, 1983. 120pp. Supervisor: E. Glenadine Gibb

Subdivision, a subconcept of rational number and measurement, was studied in its formative stages. The study was designed to answer the questions: (1) Is there a difference between first-graders' performances on selected tasks involving subdivision of discrete and continuous materials? (2) Is there a difference between first-graders' performances on selected subdivision tasks when the tasks are presented directly and in story context? (3) How do first-graders approach subdivision tasks?

An instrument of 18 subdivision tasks was administered to 20 students selected randomly from four first-grade classrooms in a central Texas city. Ratings were assigned to the subdivision performances. Measures of central tendency and composite ratings were calculated for the tasks. The frequency of successful subdivisions, defined as those that produced the correct number of equal parts and used the entire unit of materials, was computed. A chi square test was used to test for differences in the students' performances based on frequencies of successful subdivisions with respect to discrete and continuous materials and direct and story presentations. Observations of students' behavior and verbal expressions during the subdivision activities were recorded and analyzed for identifying trends in performance and approaches to subdivision tasks.

Statistical evidence ($p < .001$) indicated a difference between students' performances in subdivisions of discrete and continuous materials. Students achieved a greater number of successful subdivisions with discrete objects than with continuous (length and area) units of material. When subdivision tasks were presented in direct and story contexts, results indicated that a difference in performances with respect to mode of presentation is not to be expected. Eight approaches to subdivision were identified: distribution, estimation, counting and using basic arithmetic facts, using a pattern, dichotomy and successive dichotomy, fragmentation, verifying equivalence and congruence, and trimming. It was concluded that ability to subdivide discrete material precedes that for continuous material. Sequential development of specific components of subdivision ability was indicated.

### STRUCTURAL COUPLING AND SCHOOL OUTCOMES: JOB SATISFACTION, STUDENT ATTITUDES AND PERCEPTIONS OF SCHOOL, STUDENT ACHIEVEMENT IN READING, STUDENT ACHIEVEMENT IN MATHEMATICS, AND PERCEIVED ORGANIZATIONAL EFFECTIVENESS

Order No. DA8309303

McDonald, David G., Ph.D. *University of Kansas*, 1982. 137pp.

Some scholars have begun to reject the notion that schools are tightly linked bureaucracies and to accept the proposition that schools lack close internal coordination, especially for the content and methods of instruction. For example, Meyer and Rowan (1978) concluded that instruction tends to be removed from the control of the organizational structure in both its bureaucratic and collegial aspects. Moreover, Dornbush and Scott (1975) discovered no evidence of effective evaluation or control in school systems. As a result of these and similar findings, March and Olson (1976) and Weick (1976) conceptualized school structure as loosely coupled.

Loose coupling means that the parts, units, or subsystems are relatively disconnected and lack interdependencies. Weick (1976) described the concept with the image of a school in which the parts are responsive to one another, yet each preserves its own identity and physical or logical separateness. Therefore, the activities of one part impact other units less than had been assumed. Mintzberg (1979) provided a background for understanding coupling as an important characteristic of organizations. He conceptualized organizations as being composed of several parts, which are connected by flows and linkages. The operating core is the most highly developed part of professional bureaucracies, such as schools.

Structural coupling was hypothesized to be a significant predictor of the organizational effectiveness of schools. While no universally accepted standard exists to guide research on school effectiveness, a multidimensional approach has been proposed (Steers, 1975; Gibson, Ivancevich, & Donnelly, 1975). The five school outcomes of teacher job satisfaction, student attitudes and perceptions of school, student achievement in reading, student achievement in math, and perceived organizational effectiveness were chosen as effectiveness criteria for this study.

Data were gathered from 89 public schools in Kansas. Descriptive statistics and correlation coefficients were calculated and reported. The hypotheses were tested using a multiple regression statistical analysis. The results indicate that schools are loosely coupled and that teacher and student morale is high. With one exception, the measures of structural coupling were not effective predictors of the school outcomes used in this study. One measure of structural coupling was found to be a predictor of student achievement in reading.

## A META-ANALYSIS OF COMPARATIVE RESEARCH ON THE EFFECT OF DESEGREGATION ON ACADEMIC ACHIEVEMENT AND SELF-ESTEEM OF BLACK STUDENTS

Order No. DA83065[illegible]9

McEvoy, Thomas James, Ed.D. *Wayne State University*, 1982. 124pp. Adviser: Larry W. Hillman

The purpose of this study was two-fold. The first component replicated and extended an existing study. It was designed to determine the effect of desegregation on the academic achievement of black students utilizing the research from 1977-1982. The second component assessed the effect of desegregation on the self-esteem of black students utilizing research for the period 1955-1982.

The method employed was meta-analysis. Meta-analysis is a statistical analysis of a collection of results from individual studies for the purpose of integrating the findings.

This study also examined the relationship of variables within the sample of studies. The variables were (1) grade level, (2) study design, (3) length of desegregation, (4) mathematics compared to verbal achievement.

The interpretation of the results of twenty-nine studies indicated that the experimental (desegregated) group benefitted by .20 standard deviations in achievement studies. Specifically, the mean effect size for the experimental group was .20 standard deviations above the control group mean. When self-esteem was considered, experimental groups benefitted by .01 standard deviations.

Results for the variables in achievement studies indicated that the mean effect size for elementary students (.22) was greater than that of elementary (.18); studies with control groups showed greater effect (.48) than studies without controls (-.09); studies of more than one year demonstrated greater effect (.27) compared to less than one year (-.07); and math achievement was greater (.28) than verbal achievement (.20). Results of studies on self-esteem indicated that the elementary student's mean effect size was (.04) compared to (-.08) for the secondary level; studies without control groups showed greater effect (.10) than studies with controls (-.01); and studies of more than one year showed greater effect (.02) than those of one year or less (-.09).

When the results were analyzed, it was concluded that: (1) Students in experimental groups (desegregated) will perform at higher achievement levels than students in control groups. (2) The overall effect of desegregation on self-esteem is inconclusive.

## SELECTED FACTORS IN THE CONCEPTUAL SYSTEMS OF GEOMETRY TEACHERS: FOUR CASE STUDIES

Order No. DA8320118

McGalliard, William Augustus, Jr., Ed.D. *University of Georgia*, 1983. 409pp. Director: Thomas J. Cooney

The conception of geometrical knowledge communicated through instruction, aims in teaching geometry, and evaluative assessments of students for four high school geometry teachers were investigated in detail. Extensive observations, interviewing, and teachers' written responses were used to obtain an individual profile of each teacher's conceptualization of the factors of interest. These profiles took the form of four case studies.

Perry's scheme of ethical and intellectual development was employed to analyze the conception of geometrical knowledge communicated by the teachers through their instruction. The teachers' aims in teaching geometry were compared with historical aims for geometry instruction and with categories derived from curriculum literature. Finally, results from attribution theory were used to aid in analyzing the teachers evaluative assessments of students.

A cross-case analysis was made with these general findings. The conception of geometrical knowledge communicated by the teachers was overarched by dualism. However, a multiplistic conception of geometrical knowledge was promoted when proof was taught. Two types of aims for teaching geometry were mentioned by the teachers. First, the teachers spoke of geometry affecting student thinking. Three teachers believed that geometry would have impact on students' general thinking, that is thinking in all contexts. On the other hand, one teacher believed that geometry would promote mathematical thinking only. A second aim indicated by some of the teachers was a desire to insure a smooth running school system. Characteristic manifestations of this was a desire to complete the syllabus, urgency about preparing students for the next mathematics course, and a need to cover the subject matter in consultation with other teachers. The teachers' evaluative assessments of students were marked by diversity. These assessments ranged from general negative attributions and expectations to unquestioning positive attributions and expectations.

## THE RELATIONSHIP BETWEEN LEARNING METHODS AND ACADEMIC ACHIEVEMENT IN 10-YEAR-OLD BOYS

Order No. DA8303704

McGee, William Earl, Ed.D. *The University of Tennessee*, 1982. 68pp. Major Professor: Thomas W. George

The relationship between students' learning methods and their academic achievement was examined in this study. The 48 subjects used in this study were divided into four different groupings on the basis of their academic achievement. The first grouping was made on the basis of teacher ratings of performance in reading and arithmetic, and the remaining groupings were based on achievement test scores in reading and arithmetic.

A series of discrimination problems were posed to each of the 10-year-old male subjects using a method adapted from that used with college students by Levine, Miller, and Steinmeyer (1967). Up to 60 cards were shown to each subject; each card contained three shapes, and each shape was positioned randomly in one of three locations on the card and colored randomly with one of three colors. There was a total of nine discriminants. Each subject was given two practice problems, followed by four problems on which outcome feedback was provided on every third trial. Data were analyzed for the number of problems completed, the number of trials to completion, three-trial units, two-trial units, and for relationships among the dependent variables.

The findings included no support for a relationship between hypothesis-testing strategies and academic achievement groupings. However, there was a relationship between arithmetic achievement test scores and the number of problems completed, and there was an overall population tendency for hypothesis-sampling to be correlated negatively with the number of trials required to complete a problem.

## AN INVESTIGATION OF ATTRIBUTIONAL RESPONSES AMONG MILDLY RETARDED, LEARNING DISABLED, LOW ACHIEVING, AND HIGH ACHIEVING STUDENTS FOLLOWING SUCCESS AND FAILURE ON ACHIEVEMENT TASKS

Order No. DA8302081

McGuire, Joan Mousaw, Ph.D. *The University of Connecticut*, 1982. 123pp.

To determine whether elementary school students of various learning characteristics were different in their explanations for success and failure in achievement tasks, a sample of 48 children, functioning at mental ages of eight and twelve, and classified as mildly retarded, learning disabled, low achieving and high achieving, were administered reading, math and puzzle tasks under success and failure conditions. A forced choice attribution response format was used as the dependent variable, with subjects asked to select one of four possible causes (ability, effort, task ease/difficulty, luck) to explain an outcome. Responses were analyzed according to the dimensions of locus of causality and stability.

Findings of this study indicated that success and failure conditions resulted in differences in locus scores, with all students attributing successes more to internal factors (ability, effort), and failures more often to external factors (task, luck). Regardless of condition, older high achievers gave responses indicative of a more internal locus.

Learning disabled students at mental age 12 more frequently attributed their successes to external factors, their failures to internal factors. The type of task affected stability scores, with math more often attributed to unstable factors (effort, luck) than either reading or puzzles. Successful outcomes for the academic tasks of reading and math were most often attributed to effort. There were differences in locus scores according to the interaction of mental age and group. High achieving and learning disabled students at mental age 12 gave more responses indicative of an internal locus of causality, while the responses of low achieving and mildly retarded subjects at a similar developmental level were characteristic of a more external locus of causality. The interaction of task and condition differentially affected locus scores. Failure in math was more often attributed to luck, while ability was selected to explain reading failures. Success in math and reading resulted in more effort attributions.

### FIGURE-DRAWING ABILITY IN SOLVING MATHEMATICAL PROBLEMS Order No. DA8314734

McKee, Lynda Diane, Ed.D. *University of Georgia*, 1983. 185pp.
Director: Jeremy Kilpatrick

The primary purpose of the study was to investigate four characteristics (type, completeness, labeling, and accuracy) of figures drawn by students as they attempted to understand and solve verbal mathematics problems. A secondary purpose was to investigate the relationships among figure-drawing tendency, figure-drawing ability, problem-solving ability, spatial ability, mathematical achievement, and problem context.

High school students from four first-year algebra and five geometry classes were asked to solve one of three sets of eight mathematics problems that were amenable to algebraic solutions. The following day the students received a parallel form of the test, but this time they were instructed to draw a figure that would help them or someone else solve each problem; they were not to solve the problems. The students were given two tests of spatial ability, and their current grades in the course were used as a measure of mathematical achievement. The figures drawn by the students were analyzed according to four characteristics suggested by research studies.

The results showed that figure-drawing ability was moderately correlated with figure-drawing tendency, problem-solving ability, and mathematical achievement. Problem-solving ability was significantly correlated with mathematical achievement and spatial visualization but not with spatial orientation. The four figure characteristics were highly intercorrelated, suggesting they were measuring one trait rather than four. Problem context influenced the number and representativeness of the figures drawn. The poor quality of the figures was indicative of the students' failure to abstract the mathematical structure of the problems, their inability to draw good, useful figures, or a combination of both factors.

### MATH ANXIETY: AN INTERVENTION STRATEGY TO REDUCE MATH ANXIETY Order No. DA8304128

McTeer, Paul Malcolm, Ph.D. *Virginia Polytechnic Institute and State University*, 1982. 94pp.

This study investigates the effectiveness of an intervention strategy in reducing math anxiety in undergraduate students. The selection of participants is based upon their higher levels of math anxiety as measured by the Syracuse Mathematics Anxiety Scale (SMAS). The intervention strategy consists of math anxiety support groups and tutorial sessions. In the sessions, the participants discuss their problems, fears and frustrations related to mathematics. The mathematics instructor helps the individual group members examine these fears and problems, then demonstrates different approaches to possible solutions to these problems. These approaches are illustrated and then utilized by the students during the tutorial sessions. The nonthreatening atmosphere combined with the group support helps students reduce math anxiety and increases confidence.

### THE RELATIVE EFFECTS OF TEACHER TEACHING STYLE, TEACHER LEARNING STYLE, AND STUDENT LEARNING STYLE UPON STUDENT ACADEMIC ACHIEVEMENT Order No. DA8314893

Mehdikhani, Nasser, Ed.D. *The Catholic University of America*, 1983. 150pp.

The present study was designed to investigate the effects of teacher teaching style, teacher learning style, and student learning style upon student academic achievement measured by course grades in selected courses (mathematics and English). The study specifically looked at the relationship between teacher teaching style and teacher learning style to determine whether these variables were related.

The instructor subjects in this study were 16 mathematics and 32 English teachers teaching at Mt. St. Mary's, Hood, Frederick, Trinity colleges and The Catholic University of America. The Canfield (1976) Learning and Instructional Style Inventories were used to determine the teacher learning and teaching style respectively. The student subjects were 90 male and female undergraduates attending the mathematics and English classes of the teachers in the instructor sample. The Canfield (1976) Learning Style Inventory was used to determine the students learning style. The Mckeachie Student Perception of Teaching and Learning Form was used to determine the students' ratings of their English and mathematics courses and teachers. The quasi-experimental one dimensional model was employed to test the hypotheses. One-way analysis of variance was used to analyze the data.

*Findings*. The teacher teaching style had significant dependence on teacher learning style. Students whose learning style was matched with their combined teacher's teaching and teacher's learning style did not significantly achieve higher than those students whose learning style was not so matched. Students whose learning style was compatible with their combined teacher's teaching and teacher's learning style did not evaluate their teachers significantly higher than those students whose learning style was not so matched. The students whose learning style was matched with their teacher's teaching and learning style did not evaluate their courses significantly higher than those students whose learning style was not so matched. However, students whose learning style was matched with their teacher's teaching style evaluate their English course significantly higher than those students whose learning style was not so matched. The same result was not found for the mathematics course.

It was concluded that teacher teaching style had significant dependence on teacher learning style. Also no evidence was available for the effectiveness of teacher teaching style, teacher learning style and student learning style upon student academic achievement. The possible explanation may be: (1) small student sample size, (2) instructors presenting the materials to be learned in ways inconsistent with their preferred teaching style, and (3) uncontrolled variables such as student sex and intellectual ability.

### A STUDY OF CHILDREN IN SECOND GRADE WHO WERE PREDICTED TO BE READY FOR SCHOOL WHILE IN KINDERGARTEN Order No. DA8228712

Meeks, Burrelle Strickland, Ed.D. *University of Georgia*, 1982. 72pp. Director: D. Keith Osborn

Second grade criterion referenced test scores in reading and mathematics of 577 children who had attended Gwinnett County Public School kindergartens during 1978-79 were analyzed in an effort to evaluate a readiness curriculum. With parent and teacher agreement, 412 children went from kindergartens to first grades. One hundred forty-two children went from kindergartens to readiness classes. However, 23 children went from kindergartens to first grades even though the teachers had recommended placements in readiness classes. Raw scores from the Metropolitan Readiness Tests taken by the children while in kindergarten were analyzed for initial differences among the groups. Then, raw scores from the Georgia Criterion Referenced Tests - Second Grade were compared for consequent differences.

Findings indicate that the significant differences evident among the groups in reading and mathematics at the end of kindergarten no longer existed at the end of the second grade two or three years later;

that placement in classes after kindergarten should be made with the parents' complete support and that there are children who benefit from an extra year for developing physically, socially and emotionally as well as intellectually before entering first grade classes.

### GIFTED STUDENTS' PERFORMANCE ON FORMAL OPERATIONS TASKS, WITH SOME POSSIBLE CURRICULAR IMPLICATIONS

**Order No. DA8306283**

MERRILL, DONNA MARIE, PH.D. *University of Missouri - Kansas City*, 1982. 194pp.

This study investigated the question: Do students who meet the criteria for admission to gifted programs show performance at the highest level of cognitive development? A group of forty-eight gifted high school seniors, twenty-four boys and twenty-four girls, was drawn from three metropolitan school districts in greater Kansas City. The three predictor variables were sex, science-mathematics training and mental ability (as measured by the Wechsler Adult Intelligence Scale--Revised). Students were administered a series of tasks designed to measure the conceptual variable, formal operational thought. This variable was reflected by eleven primary criterion variables, which were ten manipulative tasks designed byJean Piaget and one Piagetian-type written test designed by F. Longeot. The results indicated: (1) the group means for both manipulative and written tests were at the early formal level (4.0 and 4.4 respectively); (2) boys' means were at level 4 on both (4.4 and 4.1 respectively), while girls' means were at level 4 on the written test (4.3) and level 3 on the manipulative tasks (3.8); (3) sex had the highest correlation with the manipulative composite, .46, indicating that about 21 percent of the variance in the manipulative tasks was associated with sex; (4) students in the 101-124 range on the Wechsler scale had a group mean of 3.9 on the manipulative tasks while students in the 124-142 range had a group mean of 4.0; (5) correlations for the upper and lower mental ability groups indicated that the statistical relationship of sex and mental ability with the manipulative tasks increased markedly for the lower mental ability group, and decreased markedly for the upper mental ability group; (6) a factor analysis yielded six interpretable factors, which accounted for 78 percent of the variance in manipulative task performance; (7) in the factor analysis, mental ability appeared discriminable from formal thought. It was concluded that students who met the criteria for admission to gifted programs did show performance at the formal operational level, but at an early stage. Some possible curricular implications were suggested, using the concept of formal operations as an organizational framework.

### ACHIEVEMENT WITH AND WITHOUT COMPUTER-ASSISTED INSTRUCTION IN THE MIDDLE SCHOOL

**Order No. DA8311071**

MERRITT, ROBERT L., ED.D. *University of Southern Mississippi*, 1982. 136pp.

This study determined the differences in students receiving computer-assisted instruction in an experimental group from those receiving departmentalized instruction in a control group on variables of achievement, self-concept, anxiety, attitude toward teacher, and attitude toward school. The study also determined the differences according to grade and sex.

The subjects for this study consisted of matched pairs, male and female, of 144 elementary sixth and seventh graders, predominantly black and from rural, lower socioeconomic backgrounds. There were two major groups of students, one experimental and one control group of equal size and sex for each grade, thus making four research groups. All subjects were below grade level.

Experimental groups achieved significantly higher gains in reading and mathematics than did control groups. There were no significant differences in groups on self-concept. The same was true for anxiety, attitude toward teacher, and attitude toward school for sixth grade girls, seventh grade girls, and seventh grade boys. However, there were significant differences favoring the experimental group of sixth grade boys on the same variables.

Additional research is warranted utilizing the design described herein on CAI using IQ and parental attitudes toward school as additional variables. Also, further research is needed using larger samples from different school systems and different socioeconomic backgrounds.

### TEACHING PROBLEM SOLVING IN A COLLEGE LEVEL GENERAL EDUCATION MATHEMATICS CLASS

**Order No. DA8229949**

MEYER, LAVERN JAMES, PH.D. *The University of Iowa*, 1982. 163pp. Supervisor: Professor Harold L. Schoen

The purpose of this study was to examine the effects of instruction in specific problem-solving heuristics on the problem-solving skills and attitudes of beginning college students in a general education mathematics class.

This study involved the teaching of problem solving to a treatment group and a control group. The treatment group was taught a problem-solving model consisting of the stages: (1) getting to know the problem; (2) choosing what to do; (3) doing it; and (4) looking back. The control group was taught in the usual way without reference to a problem-solving model. Both groups were given the same assignments, attitude surveys, and problem-solving tests. Problem solving interviews were conducted to gain additional information regarding how students solve problems.

The results show no significant difference between the mean scores obtained by the treatment group and the control group of the problem-solving tests. There was a significant difference between the two administrations of the Attitude Survey.

The main conclusions were: (1) The teaching of problem solving improves student attitude with regard to the solving of word problems; (2) Few students use the problem-solving stage of looking back; and (3) Problem-solving skills can be taught in various ways, at different levels, and in several settings.

### MINIMUM-COMPETENCY TESTING: THE IMPACT ON LEARNING DISABLED STUDENTS

**Order No. DA8317948**

MILLER, KELLY FLYNN, PH.D. *University of Kansas*, 1983. 216pp.

This study consisted of a three-phase, descriptive investigation. The first phase investigated the importance of the Kansas Minimum Competencies for the school success of learning disabled students. Learning disabilities specialists, regular class teachers, and parents of learning disabled students judged that the competencies were important for learning disabled students.

The second phase compared learning disabled students' performance on the *Kansas Minimal Competency Test* under various administration procedures to nonhandicapped students' performance under standard administration procedures. Results showed that learning disabled students did not perform as well as their nonhandicapped peers under any administration procedure. However, oral administration and out-of-level testing separately and combined increased learning disabled students' performance in reading. Only out-of-level testing was helpful for mathematics.

The items for objectives which were affected neither by oral administration nor out-of-level testing were modified in Phase III. Modifications included (a) out-of-level testing two grade levels above the level designated by test developers, (b) rewriting stems and foils to simplify linguistic construction, (c) defining information requested, (d) extracting information from embedded context, and (e) manipulative devices for mathematics computations. The modifications did not improve the performance of learning disabled students.

### MEASUREMENT PROCEDURES AND THE DEVELOPMENT OF QUANTITATIVE CONCEPTS

**Order No. DA8308098**

MILLER, KEVIN FRANCIS, PH.D. *University of Minnesota*, 1982. 170pp.

The role that measurement procedures play in children's reasoning about quantity was explored in three studies. Measurement procedures are conceived of as any systematic procedures by which children establish quantitative relationships. The first study consisted of an observational analysis of children's spontaneous procedures, while the second and third experiments compared children's understanding of measurement-related transformations with tasks developed from Piagetian and information-integration approaches, respectively. Children aged 3,5,7, and 9 years were subjects in all studies.

In the first study children were asked to evenly divide materials emphasizing number, length, area and volume. Accuracy of performance was noted and strategies employed were analyzed. While a general increase with age in accuracy of performance and sophistication of strategy employed was observed, younger children exhibited a number of systematic errors based on inappropriate extension of measurement procedures (e.g., counting) from one domain into other tasks. Comparatively little change in strategy use with development was observed for the number and volume tasks, where young children were familiar with strategies (counting and comparing levels) also used by older children. Substantially more developmental variation was observed on length and area tasks, although children tended to use the same general strategies for both length and area problems.

In the second study, transformations relevant to a quantitative domain (such as changing number on a number task) were contrasted with other transformations, including standard Piagetian tasks in the domains of number, length, area and volume. Some procedures affected quantity in a manner different from their effect on a measurement procedure, such as halving one of a set of items (which increases number but not quantity); these transformations are more difficult for children to comprehend than are standard Piagetian transformations.

A third study contrasted children's apparent use of a height + width averaging strategy in judging area with their ability to estimate the number of tiles necessary to cover that area. While apparent adding of dimensions was noted when children rated size of areas; in the task of counting out tiles children appeared to use area information appropriately. Implications of these findings for the distinction between understanding quantitative invariants and being able to use them in limited contexts were discussed.

## PLAYING A LOGIC GAME: FROM CHILDHOOD TO ADOLESCENCE

Order No. DA8301595

**Minsky, Shulamith K., Ed.D.** *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 152pp. Chairperson: Richard De Lisi

A review of theory and research in formal operations is presented and interpreted as indicating that logic and strategy games may offer an appropriate context for a new look at adolescents' thinking.

A code-breaking game for two players (Mastermind, Invicta Ltd. 1972), has been chosen as the focus of this study. A three-stage model, applicable to the development of expertise in any logic game was proposed. The three stages were labeled Naive, Corrective and Strategic play. A correspondence between these stages and Piaget's major cognitive-developmental stages was proposed.

Game behavior of 71 fifth, eighth and eleventh graders was analyzed. Results indicated that subjects in this age range could be characterized as "Corrective" players. Development of expertise within this stage was demonstrated: Developmental progression was found in the mean game scores, in a measure of redundancy and in the adherence of subjects to three corrective strategies. Results of seven written Mastermind problems, developed for the present study, supported the above findings.

Relationships between the Mastermind tasks and written versions of the Combinations and Water-level tasks indicated a common underlying cognitive domain. School achievement measures were shown to have low correlations with the game and moderate correlations with the written tasks. Sex-differences, favoring boys were found on the game but not on any of the written tasks.

Findings were discussed in terms of justification for the use of logic/strategy games as experimental tasks in cognitive-development research and in terms of the empirical support for the proposed model. Suggestions for future research were also presented.

## FACTORS ASSOCIATED WITH CHANGES IN ACADEMIC ACHIEVEMENT AND ADAPTIVE BEHAVIOR

Order No. DA8319652

**Minter, Mary Louise Davis, Ph.D.** *The University of Texas at Austin*, 1983. 283pp. Supervisor: Thomas D. Oakland

Childhood is a time of change. During middle childhood, when academic and social development become focal points in the development process, the sequence and predictability of development become less orderly than in early childhood. As learning occurs, changes in children's academic performance and social behaviors can be observed. The purpose of this study was to observe whether important changes occur in the percentile scores of children's academic performance and/or in their scale scores on social development measures during this period of life, and to identify variables associated with such changes.

Thirty-six children varying in ages from 5 years to 12 years, from a large school district in Texas, were administered the *California Achievement Test* in reading and math on two occasions. Mothers of the children were asked to complete the *Adaptive Behavior Inventory for Children* also on two occasions.

Changes in the percentile scores on the academic tests and in the scale scores of the adaptive behavior measures were computed. The mean changes on each measure were analyzed for the total group, males, females, blacks, Mexican Americans, whites, low SES students, and middle SES students. In the area of reading, important changes were observed only for blacks ($X = 11.0$). In math, no important changes were observed. Important changes were observed in adaptive behavior for all groups except blacks ($X = 0.6$) and whites ($X = -4.4$).

Correlations obtained between change scores on each dependent measure and sixteen variables found to be associated with reading and/or math achievement reflect few consistent patterns of relationships between groups.

Finally, using stepwise multiple regression methods, analyses were conducted to determine the contribution of four independent variables to the total variance in change scores for each group.

## THE IMPACT OF GENDER, MASCULINITY, AND FEMININITY ON MATH ACHIEVEMENT AND COURSE DECISIONS

Order No. DA8300943

**Moller, Nancy J., Ph.D.** *Purdue University*, 1982. 90pp. Major Professor: Norbert Nelson

There were two major purposes for this study. One was to assess the impact of the psychological attributes of masculinity and femininity on achievement in mathematics. The second purpose dealt with factors used in decision-making by eighth graders when faced with mathematics course-taking choices. The research questions asked were the following: (1) Did achievement in mathematics differ by sex or sex role identity? (2) Did student decision-makers rely on the six information cues (career usefulness, parental support, female friends support, male friends support, teacher support, and achievement) differently by sex or sex role identity when choosing future mathematics courses?

The sample consisted of 350 eighth grade students from two junior high schools, one from a medium-sized Midwestern city setting, the other in a university community. Achievement scores were obtained from school records. Masculinity and femininity were measured by the Spence-Helmreich Personal Attributes Questionnaire. Eighty-seven of the eighth graders participated in a simulation decision-making exercise using 140 cue profiles.

The effects of sex, masculinity and femininity on achievement were assessed using analyses of variance and multiple regression. No sex differences were found in mathematics achievement for measures of concepts, problem-solving, and a total achievement score; however, females did significantly better than males in computation. Students classified as androgynous and masculine had significantly higher achievement scores in mathematics than those classified as feminine and undifferentiated. Factors influencing choice of mathematics courses were examined using the Brunswick Lens Model. Results revealed that both males and females based math course-taking decisions on career usefulness and achievement score cues, but females ranked male friends as very influential in math course choices. Parent and female friends were perceived as the least influential for both sexes. Teachers affected females' decisions more than decisions made by males relative to math course choices.

## A COMPARATIVE ANALYSIS OF THE STRUCTURE OF TWO VERSIONS OF THE GRADE TEN MICHIGAN EDUCATIONAL ASSESSMENT PROGRAM MATHEMATICS TEST

Order No. DA8315615

MOORE, JOANNE ELLEN, PH.D. *Wayne State University*, 1983. 266pp.
Adviser: Donald R. Marcotte

Each year the Michigan Educational Assessment Program (MEAP) tests all Michigan students' knowledge of basic reading and mathematics skills at grades four, seven, and ten using an objective-referenced test. In 1980, these tests were revised in terms of the numbers of objectives and skills tested, and the numbers of items per objective. This study examined the old and new forms of the Grade 10 MEAP mathematics test using a series of factor analyses which attempted to uncover the underlying structures of the two forms of the test. The purpose of these analyses was to ascertain if the factor structure of the fourteen objectives which were common to the two instruments was maintained when the number of items per objective was reduced; secondly, to determine if the uncommon objectives measured similar traits; and, finally, to compare the performance of students who took both forms of the test to determine to what extent longitudinal comparisons across forms of the test were appropriate.

Principal components analysis with iterations followed by varimax rotation was used and factor scores were produced for each of the 557 subjects in this study. These scores were then correlated in order to determine the relationships among the factors produced by the two forms of the test. This procedure was appropriate since each of the subjects had taken both forms of the Grade 10 MEAP mathematics test.

The old and new forms of the Grade 10 MEAP mathematics test were found to be different in several ways. The old form of the test yielded five factors while the new form yielded three. When the fourteen objectives which were common to the two forms were factor analyzed together, omitting the additional objectives from both tests, the resulting factors reflected the tendency of objectives to cluster on factors based upon the test form rather than the content of the objectives. This result also occurred when the remaining objectives were factor analyzed and persisted through four attempts to account for it by recoding the scores. Decisions based upon the results of the two forms were also found to be different using the MEAP criteria.

## A STUDY OF THE EFFECTS OF COOPERATIVE PLANNING IN PROVIDING FOR INSTRUCTIONAL INTEGRATION FOR MILDLY HANDICAPPED HIGH SCHOOL STUDENTS MAINSTREAMED IN MATHEMATICS AND ENGLISH CLASSES

Order No. DA8306921

MOORE, SUSAN LEE, PH.D. *Wayne State University*, 1982. 162pp.
Adviser: Dr. Thomas M. Buescher

*Statement of the problem*. This study was designed to investigate a systematic attempt to extend the individualized educational planning process to include planning for and implementation of instructional integration for mildly handicapped secondary students in general education English and mathematics classes. The specific process used in the study was the Plymouth Cooperative Planning Model. The process provided a systematic communication system which defined specific steps for special and general educational teachers to use to assist the handicapped students in meeting course requirements.

*Procedure*. The subjects were mildly handicapped learning disabled and emotionally impaired high school students. The treatment group involved two samples: students mainstreamed in English classes and students mainstreamed in mathematics classes. The contrast group involved the same number of students with the same type of handicaps in similar courses. The following data were collected for the two groups: (1) mean number of absences, (2) proportion of classroom assignments completed, (3) mean grade point received, (4) gain scores in reading vocabulary and comprehension for students in English classes, and (5) gain scores in mathematics computation and application for students in mathematics classes. Differences between the groups were computed on the above variables.

*Conclusions*. The process had positive effects in providing for more instructional integration for the handicapped students in both types of classes, but the effects differed between classes. It appeared that the types of activities provided in English classes were more amenable to modification for handicapped students, since the English class teachers were able to make more modifications in the content of information provided to the students as well as in the methods by which the students received and responded to information in the classes. The process seemed to provide better instructional integration for handicapped students in English classes, since the students involved in the process in these classes received significantly higher grades and showed significantly greater academic achievement gains. The process appeared to increase instructional integration for handicapped students in mathematics classes, since they completed a significantly higher proportion of assignments than did their comparison counterparts.

## SELF-TEACHING ENRICHMENT MODULES ON MODERN APPLICATIONS OF MATHEMATICS FOR TALENTED SECONDARY STUDENTS AND EVALUATION OF EFFECTIVE UTILIZATION THROUGH AN ORIGINAL PREDICTION MODEL

Order No. DA8324117

MORNINGSTAR, KAY GLADYS, PH.D. *University of Delaware*, 1983. 267pp. Professor in Charge: Clifford W. Sloyer

This is a study designed to evaluate the effective use of self-teaching enrichment modules on modern applications of mathematics for talented secondary school students. These modules include topics on linear programming, geometric programming, Diophantine equations, piecewise linear functions in machine location problems, and symbolic logic in medical diagnosis. Modules are in self-teaching format and can be used by mathematically talented students independently of teacher background.

Seventy-six Algebra II students were each given three of the modules to study. Modules were to be worked in addition to normal classroom activities and no rewards were given for student endeavors. Quizzes were administered upon the completion of each module.

The results of the study indicate that students were able to comprehend the material presented in these modules. In comparing experimental groups who received the modules to comparable control groups who did not receive the modules, no meaningful significant differences in gain scores on achievement and attitude tests were found.

An outcome of this study is the development of an original prediction model through the use of what is called a Proficiency Score. A Proficiency Score is a sum of scores which is derived from coding results of student scores from an achievement test and five attitude scales. Four different coding systems were developed with a predetermined success criterion based on module quiz results.

Relative information gains were calculated in order to rate the predictive powers of the Proficiency Scores. In all cases the Proficiency Score proved to be a better predictor of student success on the modules than individual variables such as achievement score, sex, grade, or the five attitude scales.

The Proficiency Score is designed to aid teachers in making valid recommendations on a student's ability to comprehend the material presented in these modules.

## THE EFFECTS OF A CLASSROOM VOLUNTEER PROGRAM ON ACHIEVEMENT, SELF-CONCEPT, AND BEHAVIOR AMONG PRIMARY GRADE PUPILS

Order No. DA8304875

MOSLEY, ELAINE S. CHRISTIAN, ED.D. *Oklahoma State University*, 1982. 171pp.

*Scope of Study*. Problems of society, both social and economic, are becoming more acute. Possible solutions appear to point toward the necessity of making fuller and wiser use of all human potential and resources. The purpose of this study was to investigate the effects of classroom volunteers of reading and math achievement, self-concept, and behavior children in the primary grades. Specifically, the major problem was reflected in the following question: Will achievement, self-concept, and behavior scores of a group of primary pupils who have had contact with classroom volunteers be significantly different from achievement, self-concept, and behavior scores of a similar group of primary pupils who had no contact with classroom volunteers? A sample population of 317 pupils, including 96 first graders, 94 second graders, and 127 third graders, was selected for the study. These instruments were used to test the hypotheses: (1) *SRA Achievement Series*--Math and Reading, (2) *Piers-Harris Self-Concept Inventory*, and (3) the Behavior Rating Profile. The study used a nonequivalent control group design. There were 241 participants in the experimental group and 76 in the control group. Treatment for the experimental group included trained classroom volunteer tutorial services on an individual and small group basis. The hypotheses were tested for significant differences between groups using a one-way analysis of variance.

*Findings and Conclusions*. Significant differences of average scores were found in favor of the experimental group in math concepts between groups of second grade pupils. Significant differences for average scores were found in favor of the control group in vocabulary, comprehension, and math concepts between the groups of third grade pupils. The following conclusions were derived: (1) The selection procedure used in this study appears to have been inappropriate for an investigation of this kind and (2) The use of unmatched groups appears to have distorted the research findings in favor of the control group, particularly since the statistical operation did not show the direction (less or greater) of the significant difference.

### BILINGUAL-MULTICULTURAL EDUCATION: A COMPARATIVE STUDY OF THE ACADEMIC GROWTH OF BILINGUALLY INSTRUCTED FOURTH AND SIXTH GRADE PUPILS TO THAT OF MONOLINGUALLY INSTRUCTED FOURTH AND SIXTH GRADE PUPILS Order No. DA8303159

**Mosely, Fleming J., III, Ed.D.** *The University of Akron*, 1983. 260pp.

The study was conducted with the fourth and sixth grade classes of two elementary schools with similar Hispanic student populations in Northeastern Ohio. The purpose of the study was to determine whether or not the Hispanic and non-Hispanic students attending the school with a bilingual-multicultural education program would demonstrate significantly greater academic growth in the basic skills of reading and mathematics than would their Hispanic and non-Hispanic counterparts who were instructed solely in English. The 71 fourth and 59 sixth grade program group subjects had been involved in bilingual-multicultural education since kindergarten while the 78 fourth and 68 sixth grade students of the control group were instructed only in English for the same period of time. Both the program and control groups were pretested and posttested during the project year with the reading and mathematics achievement measures of the Comprehensive Tests of Basic Skills (Level 1, Form S for the fourth grades and Level 2, Form S for the sixth grades). The subjects' gain scores on reading vocabulary and comprehension and mathematics computations, concepts, and applications were analyzed separately with the statistical procedure of multiple linear regression for the fourth and sixth grade subjects of the program and control groups while controlling for the following variables: socio-economic status, ethnicity, aptitude, language dominance, the amount of Spanish spoken in the student's homes, and the teachers' expectations of the students' academic growth. The significant findings at the .05 alpha level of a one-tailed test were as follows: (a) Bilingual-multicultural education had a significant impact on numerical facility for Hispanic and non-Hispanic pupils. (b) When the effects of poverty were removed, bilingual-multicultural education was a much better program in terms of reading and mathematics improvement for Hispanic and non-Hispanic pupils. (c) Bilingual-multicultural education was a significantly better program for fourth grade Hispanic and non-Hispanic pupils regarding academic growth in reading vocabulary and mathematics computations. (d) And, bilingual-multicultural education was a significantly better program for sixth grade Hispanic and non-Hispanic pupils in regards to academic growth in the areas of reading comprehension and mathematics concepts.

In all, 75 hypotheses were tested and covaried with 36 variables. Limitations to the present study were presented and recommendations for further research were offered.

### STRATEGY CHOICE AND PERFORMANCE IN SYLLOGISTIC PROBLEM SOLVING IN FEMALE HIGH SCHOOL STUDENTS Order No. DA8320002

**Moylan, Patricia Marie, Ph.D.** *Boston University Graduate School*, 1983. 104pp. Major Professor: Jean Berko Gleason

This study was designed to examine the relationship of verbal and mathematical reasoning ability in female high school students. Literature citing the traditional verbal or "left-hemisphere approach" to formal mathematics education is discussed. Based on scores earned on the *Scholastic Aptitude Test*, fifteen subjects were selected for each of four groups: high-math, high-verbal; high-math, low-verbal; low-math, high-verbal; low-math, low-verbal. Three tasks were administered to all subjects: eight types of three-premise linear syllogisms presented in a verbal and nonverbal format (using the model proposed by Sternberg, 1980) and the *Rey-Osterrieth Complex Figure*, a task of visuo-constructional organization. Strategies used to solve the syllogisms were classified as either verbal (Jim is faster than Andy; M is greater than S) or symbolic ($J > A$; $M > S$). It was hypothesized that in comparing performance, high-math subjects, regardless of verbal ability, would consistently use symbolic strategies in solving both types of syllogisms, would score a higher percentage of correct responses, and have faster reaction times. Low-math subjects were predicted to be inconsistent in their strategy choice. Each subject was given a style score (either holistic or part-oriented) on the *Complex Figure* to determine if ability group was a good predictor of organizational style. Results indicated that across syllogism type, high-math subjects used symbolic strategies almost exclusively, scored a higher percentage of correct responses ($p < .05$), and had the fastest reaction times ($p < .05$) when compared to the low-math groups. Collapsing across verbal ability, there was no significant effect of math ability. This demonstrates that despite a subject's high-math ability, her high percentage of correct responses is due to strategy choice rather than math ability. On the *Complex Figure*, high-math subjects consistently demonstrated a holistic organizational style and that low-math subjects used either style equally as often. The hypotheses regarding performance and ability levels were confirmed suggesting that symbolization is the most effective and efficient means of solving this type of problem. Implications for the formal instruction of mathematics are presented and discussed.

### NONSTANDARD ANALYSIS AND ITS PLACE IN UNDERGRADUATE EDUCATION Order No. DA8313380

**Nagarkatte, Shailaja Umesh, Ed.D.** *Columbia University Teachers College*, 1983. 196pp. Sponsor: Professor Paul Rosenbloom

In the 1950's a mathematical logician Abraham Robinson discovered ways to make rigorous the intuitively attractive infinitesimal methods, beginning a branch of mathematics called Nonstandard Analysis.

Nonstandard Analysis deals with nonstandard models. These are proper ordered field extensions of real numbers which include infinitesimals and infinite elements. Consequently the notion of an infinitesimal neighborhood is no longer a self contradictory figure of speech but a precisely defined concept as legitimate as any other in analysis. Nonstandard analysis resolves old paradoxes and increases certain lines of reasoning that have been fruitful since before Archimedes.

The dissertation explains the development and basic ideas of Nonstandard Analysis from the axiomatic and the logical approach. A weak version of the 'Transfer Principle' using Henle and Kleinberg's methods is proved, which clarifies in what sense Leibniz was correct in saying that what holds true for the real numbers also holds true for the extended number system.

When elementary calculus is developed using infinitesimal approach, the basic concepts become simpler and arguments more intuitive, provided the nature of infinitesimals is explained clearly. A number of examples based on the concepts of limits, continuity, differentiation and integration have been discussed. Applications of Nonstandard Analysis to the fields of Algebra, Physics and Economics have been presented. There seems to be considerable pedagogical payoff from the greater simplicity and closeness to intuition.

This dissertation discusses how these ideas have been used in teaching elementary calculus. It also explores how Nonstandard Analysis can be used in the general undergraduate mathematics curriculum. It seems appropriate to introduce the subject in detail at the level where axiom of choice, Dedekind cuts or Cantor's methods of Cauchy sequences are discussed. However, teachers should be well-trained before introducing the subject at any level.

Such writing on a subject which has made intuitive ideas of great historical significance logically consistent, giving an alternative approach for teaching calculus and which has potential applications in various fields should be of interest to the teachers and students of mathematics at the undergraduate level. Basic knowledge of Calculus and Abstract Algebra is assumed of the reader.

## INSTRUCTIONAL TELEVISION: THE EFFECTS OF DIFFERENT TYPES OF GRAPHICAL REPRESENTATION, IN COLOR, OF QUANTITATIVE DATA ON THE PERCEPTION OF CHARTS

Order No. DA8308868

Napoli, Luigi, Ph.D. *Indiana University*, 1982. 109pp. Chairperson: Dr. Dennis Pett

*Problem*. Graphical representations, such as colored circle charts, are increasingly used in television because they can display a great deal of information. Guidelines concerning the use of color for television graphic specialists are almost non-existent. This study was an attempt to determine the best combination of circle chart and background colors for representing statistical data. The questions under consideration were as follows: (1) Does the use of different colors affect the accuracy of estimating the size of parts of a whole when presented on a television screen? (2) Does the use of different colors affect the rapidity of estimating the size of parts of a whole when presented on a television screen?

*Procedure*. The experimental testing involved the presentation on a television screen of sets A and B of 30 combinations each of circle chart and background colors. The sample used in this investigation consisted of 180 instructors from Quebec who were randomly assigned to equal experimental groups A and B, respectively related to sets A and B. Subjects who declared themselves to be daltonians were not accepted. Six colors were used for both sets. The subject's task was to estimate, in percentage, each of the five parts of the circle chart shown on a television screen. Each combination was estimated by 3 subjects separately. The time of estimation of each chart was recorded by the researcher. The data was analyzed by computer using SPSS program ANOVA, version 8-3, January 21, 1982.

*Results and conclusions*. The results of the first two analyses of variance showed no significant differences between groups A and B, in relation to accuracy of estimation, $F$ value of .452 ($p$ = .502), and in relation to rapidity of estimation, $F$ value of .289 ($p$ = .591). Therefore, these two groups were combined into one to carry out further data analysis. The other analyses of variance concerning the effects of background colors for each of the six chart colors, for both accuracy and rapidity of estimation, did not show significant differences. The related $F$ values varied from 1.739 ($p$ = .173) to .043 ($p$ = .996). The major conclusions of this study were as follows: (1) The use of different colors does not affect significantly the accuracy of estimating the size of parts of a whole when presented on a television screen. (2) The use of different colors does not affect significantly the rapidity of estimating the size of parts of a whole when presented on a television screen.

## CHILDREN'S SKILLS AND SELF-PERCEPTIONS IN MATHEMATICS

Order No. DA8304559

Newman, Richard Stuart, Ph.D. *The University of Michigan*, 1982. 195pp. Chairman: Scott G. Paris

Two studies were carried out to investigate the relationship between children's mathematics skills and self-perceptions. Both employed the same sample of children. Study 1 was a longitudinal analysis of the children's achievement and self-ratings of ability in mathematics across grades 2, 5, and 10. Causal modeling showed that between grades 2 and 5, math achievement is causally related to self-ratings of ability. There was evidence that between grades 5 and 10 this causal relationship diminishes. The accuracy of children's self-ratings increased between grades 2 and 5, and there was no appreciable change after that. Math achievement showed high stability from year to year, whereas stability of self-ratings was considerably less. Study 2 investigated how children's fluent use of basic numerical skills was related to their perceptions of confidence on a subjective task of quantitative estimation. Tenth graders made numerical estimates and confidence ratings of the estimates. Fluency was assessed on tasks of counting and arithmetic fact retrieval. It was found that these skills were related not only to accuracy in estimating, but also to the appropriateness of the children's confidence: skillful children made judgments that corresponded with actual task difficulty. Girls were less confident on the estimation task than boys. A derived *calibration* score corroborated ANOVA findings of the interaction of skill level and task difficulty on confidence ratings. It also revealed that while all subjects tended to be overconfident in their estimates, girls were more realistic, i.e., less overconfident, than boys. Findings are discussed in light of developmental research that shows the effect of stimulus knowledge on awareness of task difficulty in recall situations. Together, the two studies emphasize the role of children's early skill development in mathematics--in one case, on general perceptions of academic ability and in the other, on perceptions of confidence on a novel, non-academic task.

## EFFECTS OF VERBAL CUEING AND A VISUAL REPRESENTATION ON PERCENT PROBLEM-SOLVING PERFORMANCE OF REMEDIAL ADULTS

Order No. DA8308487

Noll, Rhona Susan, Ph.D. *Fordham University*, 1983. 435pp. Mentor: Lillian Restaino-Baumann

The purpose of this study was to determine whether instruction in verbal cueing, or verbal cueing with a visual representation, would have more facilitating effects on the verbal percent problem-solving performance of college remedial mathematics students, at two levels of reading ability.

The study utilized a randomized block design. The 60 subjects were selected from among 430 students registered in a remedial mathematics course of a two-year community college in New York City, during the spring of 1980.

Potential subjects were classified as Good or Poor Readers on the basis of standardized reading comprehension test scores. They were pretested with investigator developed tests of computational skills and problem-solving performance.

The subjects were given one of two treatment conditions, based upon their course sections. Each treatment consisted of three programmed, self-paced instructional packages which were parallel in form, except for the independent variable of verbal cueing versus verbal cueing with a diagram. The treatments were designed to explain and develop the language and structure used in solving percent problems.

Analyses of variance were performed on the posttest and gain score data. The results indicated that: (a) the subjects in the verbal cueing plus visual representation treatment scored significantly higher than the subjects in the verbal cueing treatment; (b) the Good Readers scored significantly higher than the Poor Readers; (c) there was no significant interaction between treatment condition and reading level for the posttest data; and (d) there were no significant gain score results.

Based upon these findings, the following conclusions were reached: (a) Good Readers were better able to understand and process the problems than were the Poor Readers; apparently reading level influenced the problem-solving performance of subjects; (b) the verbal cueing plus visual representation technique had greater effect upon performance than the verbal cues alone; and

(c) since no interaction was found between treatment condition and reading level, the premise that the treatments would be differentially effective for subjects of varying reading levels was not supported.

## THE EFFECTS OF AN INSTRUCTIONAL MODEL BASED ON THE INFORMATION PROCESSING PARADIGM ON THE ARITHMETIC PROBLEM SOLVING PERFORMANCE OF FOUR LEARNING DISABLED STUDENTS Order No. DA8322231

NUZUM, MARGARET, ED.D. *Columbia University Teachers College*, 1983. 249pp. Sponsor: Professor Jeannette E. Fleischner

The purpose of this investigation was to develop an instructional package for teaching arithmetic story problem solving skills and to examine the efficacy of that method on the story problem solving performance of four learning disabled students.

Since the advent of the computer era, the understanding of complex instructional procedures has been enhanced by data generated through application of the information processing theory to cognitive tasks. Based on descriptors from information processing psychology, a psychological task analysis of arithmetic story problem solving revealed three essential categories of knowledge: knowledge derived from the problem, tasks specific knowledge and procedural knowledge. These categories of knowledge proved to be interrelated, acting in concert with one another.

The three categories were translated into an instructional plan which included instruction in: analysis of the components of the problem; relevant task specific information i.e., recognition of addition or subtraction problems, detection of extraneous information and determination of two step problems: and procedural knowledge used to apply task specific information i.e., formulation of a plan, hypothesis generation and testing, and evaluation. Each phase of instruction was taught following the tenets of mastery learning and cognitive behavior modification.

A single subject design with three replications was employed to measure the effect of mastery of each successive phase of instruction on the baseline performance. The baseline measures, parallel forms of a 24 problem arithmetic story problem test, were administered pre and post intervention and after mastery of each instructional phase.

Results showed that a method which included instruction to mastery in analysis, task specific and procedural knowledge was responsive to the needs of the learning disabled in this study. Each subject's problem solving performance improved substantially. Discussion of findings extend beyond the development of an effective methodology for teaching arithmetic problem solving skills, and touch upon: single subject design as a tool for measuring efficacy of a curriculum for individual students; variability among subjects in problem solving; observations about information contained in the problem solving curriculum; and implications of the study for educational practice and future research.

## THE LONGITUDINAL EFFECTS OF PUPIL RETENTION PRACTICES IN THE FIRST THREE GRADES Order No. DA8309069

OLDHAM, BEN RICHARD, ED.D. *University of Kentucky*, 1982. 95pp. Director: Dr. James R. Ogletree

*Problem*. The purposes of this study were to determine if retaining students of average ability in the primary grades due to their immaturity had any longitudinal effect on student achievement in reading and mathematics and if there were resulting differences in high school attitudes toward school between students who had been retained in the primary grades and comparable students who had been routinely promoted.

Three general hypotheses were constructed: (1) longitudinal reading and (2) longitudinal mathematics achievement differences exist between students of average ability who have been retained one or more times in the primary grades and comparable students who have not been retained. (3) Differences in attitudes toward school exist between students of average ability who have been retained one or more times in the primary grades and comparable students who have not been retained.

*Design*. Students enrolled in a large high school who had been retained one or more times in the primary grades were matched by academic ability, gender, and school entry age with students who had never been retained. A matched group of 98 students made up the sample.

Achievement test data from grades 3, 6, and 10 were gathered in reading and mathematics to analyze differences in the two groups. A multivariate analysis of repeated measures design was utilized to make such a longitudinal comparison. The *School Attitude Measure* was administered to the two groups in the eleventh grade. A multivariate analysis of variance was employed to determine if there were differences in attitudes toward school in the eleventh grade between the two groups.

*Results*. (1) Students of average academic ability who had been retained one or more times in the primary grades achieved significantly higher in mathematics throughout their school careers than comparable routinely promoted students. (2) There was no longitudinal difference in reading achievement between the retained and routinely promoted students. (3) No statistically significant differences were found in attitudes toward school at grade 11 between students who had been retained one or more times in the primary grades and comparable students who had been routinely promoted.

## DIFFERENCES IN LEARNING MODALITY AS THEY RELATE TO ACADEMIC ACHIEVEMENT OF SEVENTH GRADE STUDENTS Order No. DA8318311

OLSEN, JILL TROUSDALE, ED.D. *Northern Illinois University*, 1983. 165pp.

Current research investigating perceptual and cognitive variables is oriented toward determining *how* children receive and process information and *if* it is related to academic performance. The purpose of this study was to investigate the relationship between learning modality and academic achievement. Learning modality is the ability to receive and process information via specific sensory input channels. The major sensory modes used in learning are visual, aural, and tactile channels.

The investigation addressed the following questions: (1) For seventh grade students, is there a relationship between learning modality (Visual, Auditory, Kinesthetic, and Mixed) and Reading Comprehension, Vocabulary, Listening Comprehension, Spelling, Language, Concepts of Numbers, Mathematic Computation, Mathematic Applications, Social Science, Science, Using Information, Total Listening, Total Language, and Total Mathematics when analyzed by sex and IQ? (2) For seventh grade students, is there a relationship between learning modality raw scores and achievement variables when analyzed by sex and IQ?

The sample included 188 seventh grade students from two junior high schools in a suburban community northwest of Chicago who had been administered the *Swassing-Barbe Modality Index*, *Stanford Achievement Test*, and *Otis-Lennon School Ability Test* by the district. A three-way ANOVA and correlations were utilized to test the hypotheses at the .05 level of probability.

Based on the findings of this study, it would appear that learning modality is related to academic achievement of seventh grade students in Listening Comprehension; Reading Comprehension and Using Information when analyzed by sex; and Language, Social Science, and Using Information when analyzed by IQ.

Learning modality raw score was significantly related to the 14 achievement variables for all subjects. For all average IQ group analyses, no significant relationships occurred. Modality raw score would appear to be more predictive of achievement for above average IQ males, particularly in Language, Mathematics, and Science and for above average IQ females in Mathematics and Spelling.

The significant findings of this study indicate a need for further research into learning modality's relationship to achievement at the junior high level. It may be necessary to analyze modality strengths and weaknesses more critically and develop educational programs accordingly.

## MATHEMATICAL REASONING AND ECONOMIC COGNITION OF THIRD AND FOURTH GRADE STUDENTS: A CASE STUDY OF THE MINI-SOCIETY INSTRUCTIONAL SYSTEM

Order No. DA8306099

**Ortiz, Ellen Goldman**, Ed.D. *University of California, Los Angeles*, 1982. 160pp. Chairman: Professor Marilyn Kourilsky

This study focused on possible transfer effects to mathematical reasoning of participation in an economics-oriented, experience-based instructional intervention--the Mini-Society Instructional System. Secondary foci were on economic cognition resulting from participation in the program and on possible correlations between mathematical reasoning and economic cognition.

The sample consisted of over two hundred third and fourth grade students from two school sites each of which (1) was homogeneous with regard to SES, and (2) utilized random assignment to social studies treatment. A posttest only control group design was used. Students were tested for mathematical reasoning by means of a criterion-referenced instrument developed to measure skills, the acquisition of which were thought to be accelerated as an unanticipated outcome of participation in Mini-Society. Economic cognition was measured in an interview format using questions to determine the level of students' application of cost-benefit analysis to real world problems.

Study results indicated that the strongest predictor both of mathematical reasoning and economic cognition was participation in Mini-Society. High socioeconomic status also emerged as a significant predictor of both dependent variables.

Correlations between economic cognition and mathematical reasoning for the total sample and all subsamples *except* the control group suggest that the strong association between the dependent variables was not the result of an innate relationship between mathematics and economics. The correlation may result from the "hidden mathematics curriculum" emerging from experience specific to Mini-Society or may reflect a transfer effect to mathematical reasoning of learning economics.

Recommendations for further research include studies which may clarify the latter finding. Included are sample mathematical reasoning objectives the researcher recommends for inclusion in previously existing Mini-Society Instructional Objectives.

## THE EFFECTS OF THE ITV SERIES *FIGURE OUT* ON THE MATHEMATICS ACHIEVEMENT OF FIFTH-GRADE STUDENTS IN MISSISSIPPI

Order No. DA8323349

**Owen, Mary Scott**, Ed.D. *The University of Mississippi*, 1983. 131pp. Director: Associate Professor Joan C. Carson

The study was an attempt to determine whether structured or nonstructured classroom viewing of the IRV mathematics series *Figure Out* would produce a higher level of achievement than the teaching of the same mathematics skills by a traditional classroom method of instruction.

A non-equivalent control group research design was used. Fifteen fifth-grade mathematics classes, three in each of five Mississippi public elementary schools, participated. A total of 375 students were involved.

In each of the five schools, two experimental groups and one control group were organized. Five *Figure Out* programs were utilized in the teaching of five basic mathematics skills to the two experimental groups. Experimental group one viewed a different *Figure Out* program each day for five consecutive days and participated in initiating and concluding activities correlated with the program being viewed (structured classroom viewing). Experimental group two viewed the same *Figure Out* programs as experimental group one, after receiving traditional classroom instruction which covered content parallel to the program being viewed (nonstructured classroom viewing). The control group received traditional classroom instruction covering content parallel to that being taught to experimental groups one and two. Time-on-task was equal for all three groups.

Pretesting and posttesting with researcher-made criterion-referenced instruments provided data about the mean mathematics achievement of the three groups. Gains in scores from pretests to posttests were considered evidence of mathematics achievement.

Data were computer-analyzed by a two-way analysis of covariance and a Scheffe post hoc test. The conclusions reached were that (a) the *Figure Out* series may be just as effective as traditional classroom instruction in the teaching of five basic mathematics skills (rounding numbers, subtraction with one regrouping, subtraction with two regroupings, multiplication, and division) to fifth-grade mathematics students in Mississippi public elementary schools; (b) if utilized, the *Figure Out* series should be viewed in a structured classroom setting that provides correlated initiating and concluding activities in order to obtain maximum results in student achievement; and (c) the *Figure Out* programs covering the mathematics skills of subtraction with one regrouping and subtraction with two regroupings may be more effective than the programs covering rounding numbers, multiplication, and division.

## EFFECTS OF GOAL SETTING BY CHINESE-AMERICAN CHILDREN AND THEIR PARENTS

Order No. DA8309734

**Pao, Po-Huen Lee**, Ed.D. *Boston University School of Education*, 1983. 150pp. Major Professor: Dr. Sue Warren

In traditional Chinese culture achievement is highly valued and children are expected to be obedient to parents and set high goals for them. The extent to which Chinese values and child behavior is maintained when Chinese children are exposed to the American culture is not known. The effects of goal setting have been examined in studies of American children. This study was designed to investigate the effects of goal setting by children and by parents on 36 Chinese-American children; 12 from special education, 12 from bilingual, and 12 from regular English programs. For one half of each group, randomly assigned, parents set goals for their children and for the other half the children set their own goals. Mean age was 128 months (s.d. 12 months and range 111 to 162 months).

Each child performed two tasks, one determining sums on arithmetic facts and the other cancelling letters. These tasks were selected in a preliminary study by having parents rate five tasks according to academic orientation: arithmetic was judged most and cancellation was judged not academic. For each task, the child went through three sessions: practice, control (no goal setting), and experiment (either the child or the parent sets goals). Scores of children were the sum of correct responses minus incorrect responses for four trials on each task. Each child in the group for whom parents set goals heard the goal set and was told aloud what performance was for each trial.

Analysis of variance and t-tests were used to analyze data. There was a statistically significant goal setting effect, the children performing better when they set goals. There was no statistically significant difference in performance when children set their own goals and when parents set goals for them, although the trend was for performance to be somewhat better when parents set goals.

There were no statistically significant differences among the three educational groups, although the special education group composed primarily of children who had academic problems appeared to be more variable than the other two groups.

A post hoc analysis indicated that under the goal setting conditions the students tended to make more errors on both tasks than they did without goal setting; the probability of the number of errors was higher for math task.

Discussion explored the effects and the relationship between goal setting and performance, Chinese culture and goals, and the possible effects of American culture on the Chinese-American students.

## A META-ANALYSIS OF THE USE OF MANIPULATIVE MATERIALS AND STUDENT ACHIEVEMENT IN ELEMENTARY SCHOOL MATHEMATICS

Order No. DA8312477

**Parham, Jaynie Loftin**, Ed.D. *Auburn University*, 1983. 71pp. Director: Richard Brogdon

The purpose of this meta-analysis was to summarize the effects of the use of manipulative materials and student achievement in elementary school mathematics. Results of 64 studies comparing the use-nonuse of manipulative materials and three types of manipulative materials on student achievement were analyzed and a total of 171 effect sizes calculated. Mean effect sizes for selected study characteristics were computed and multiple regression analyses were applied to explain the variation in effects among different studies. The mean effect size for the use-nonuse studies of 1.0329 indicated that of those studies representing use of manipulative materials, students scored at approximately the 85th percentile as opposed to students not using manipulative materials, who scored at the 50th percentile. Based on the studies utilized in the meta-analysis, it was concluded that most research in this area was conducted through dissertation studies during a 15 year period, 1965-1979. The majority of the studies were of moderate quality with two, three, or four treatment groups. Multiple regression analysis indicated two factors that were significant, grade level and type of study. The mean effect sizes of the studies by type, indicated that manipulative materials do have a positive effect on student achievement in mathematics. The three types of materials contributed equally to the difference in achievement scores.

## BIAS IN IQ TEST PREDICTIONS OF SUBTRACTION SKILLS LEARNING AND ACHIEVEMENT

Order No. DA8319727

**PARRA, ELENA B., PH.D.** *The University of Arizona*, 1983. 103pp. Director: John R. Bergan

The present study was conducted to address the need to compare the validity of intelligence tests in predicting learning and achievement for Mexican Americans and Anglo children. In addition, the study examined the effects of variations in the language of test administration on Mexican American children with different linguistic competences (predominantly Spanish, bilingual, predominantly English).

A widely used individual intelligence test, the Wechsler Intelligence Scale for Children Revised (WISC-R), the Spanish English Screening Instrument, a subtraction skills pretest, five subtraction learning trials and five subtraction posttests were administered to a random sample of 150 Mexican American children and 50 Anglo children. The WISC-R and subtraction pretests and posttests were used as the predictor and criterion, respectively.

The Cleary definition of bias in test use provided the basis for all analyses. Regression analysis were also performed in order to examine the effects of achievement and immediate prior learning on learning scores. In addition the Tukey Honestly Significant Difference test (HSD) was used following a one way analysis of variance to determine differences in IQ among the Anglo and Mexican American children tested under varying language conditions (English, Spanish, Bilingual).

The results indicated that IQ test scores are not suitable predictors of learning for the Mexican American group and suggested that IQ scores can be used as predictors of learning for Anglo children. It was also found that IQ scores have utility in predicting achievement for both, Mexican American and Anglo children. In addition, analysis of variance data obtained from this study revealed significant differences in IQ associated with language of test administration. It was found that Mexican Americans tested in both Spanish and English obtained significantly higher scores than Mexican American children tested in English or Spanish alone. Findings from this study suggested that regardless of linguistic competence Mexican American children appear to benefit from bilingual approach to test administration.

In short findings from this study revealed that the predictive validity of the WISC-R for Mexican American children is seriously impaired when a learning criterion is used. Implications of these findings were discussed and suggestions were made for the development of an assessment model based on learning as the criterion.

## SECOND LANGUAGE LEARNING ABILITY AND MATHEMATICAL ABILITY: THE CORRELATION OF THESE TWO VARIABLES AND THE EXTENT TO WHICH ABILITY IN ONE MAY BE USED TO PREDICT ABILITY IN THE OTHER

Order No. DA8312330

**PEEPLES, LILLA KIRK, PH.D.** *Georgia State University - College of Education*, 1983. 37pp.

*Purpose.* The purpose of this investigation was to conduct a correlational study of second language learning ability and mathematical ability. Additional studies examined the relationship between second language learning and achievement in that language and in math, second language learning ability, math ability and general intelligence, math ability and achievement in math, grade point average and general intelligence, general intelligence, grade point average and socioeconomic status.

*Methods and Procedures.* Subjects in this study included 159 public school students (54 males and 105 females) drawn from the French and Spanish classes of a large public high school bordering a metropolitan area. All subjects were administered the *Modern Language Aptitude Test*, the *Orleans-Hanna Algebra Prognosis Test*, and the *Otis-Lennon School Ability Test*. All subjects completed a questionnaire calling for socioeconomic data which were then converted into the *Hollingshead Two-Factor Index of Social Position* as a means of determining socioeconomic status. Student records were the source of grade point average calculated for French, Spanish, English, and math.

The statistical treatment of the data involved a simple correlational design (Pearson Product-Moment Coefficient of Correlation).

*Results.* Statistical analysis of the data collected indicated the following. (1) There is a moderate positive correlation between second language learning ability and math ability. (2) There is a moderate positive correlation between second language learning ability and general intelligence. (3) There is a substantial positive correlation between math ability and general intelligence. (4) There is a moderate positive correlation between the numerical reasoning component of intelligence and second language learning ability. (5) There is a substantial positive correlation between the numerical reasoning component of intelligence and math ability. (6) There is a moderate positive correlation between second language learning ability and achievement in that language. (7) There is a moderate positive correlation between math ability and grade point average in math. (8) There is a statistically significant but slight positive correlation between general intelligence and grade point average. (9) There is a minimal and nonsignificant relationship between intelligence and socioeconomic status and between academic achievement and socioeconomic status. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

## FACTORS INFLUENCING HIGH ABILITY STUDENTS IN FAYETTE COUNTY TO PURSUE FOUR YEARS OF MATHEMATICS AFTER EIGHTH GRADE ALGEBRA

Order No. DA8309071

**PELFREY, RONALD STEPHEN, ED.D.** *University of Kentucky*, 1982. 131pp. Director: Dr. James R. Ogletree

This study has examined various factors that may assist administrators in better identifying and placing students into the advanced mathematics sequence. Factors included within the study were the socioeconomic status of the student's family; I.Q.; total mathematics scores on standardized achievement tests; spatial relations test score; the junior and senior high schools attended by the student; the teachers that the student had for Algebra I, Geometry, and Algebra II; and the sex and race of the student.

The population under study was composed of students from the 1981 and 1982 graduating classes of a single participating district. Only those graduates were included who had taken Algebra I in the eighth grade and who had complete test records.

The results of the study indicated that I.Q., total mathematics achievement score, spatial relations score, and socioeconomic status of family were significantly correlated with enrollment in calculus. Males were also more likely than females to take calculus in the twelfth grade. There was an insufficient number of non-whites within this sample to analyze race as a variable.

The nested analysis found that the school attended (junior or senior high) accounted for zero percent of the variability between those who had enrolled in calculus, those who had enrolled in mathematics for three years and those who had discontinued taking mathematics after Algebra II. However, the teacher that the student had for mathematics did account for a measurable percent of variability.

The most significant finding of the path analytic studies was that the development of mathematical skill and knowledge (as measured by achievement and I.Q. tests) was sequentially and temporally oriented for this sample. The period of time from the fifth through the eighth grades appeared to be the most critical period for these subjects. The strongest direct and indirect effects on both enrollment in calculus and a final achievement test measure (*American College Test* - Mathematics) were found during this period.

## MENTAL ARITHMETIC: THE PROCESSING AND MAINTENANCE OF INFORMATION IN WORKING MEMORY

Order No. DA8311275

**PEREZ, WILLIAM AUGUSTIN, PH.D.** *Miami University*, 1982. 91pp.

Five experiments were conducted to investigate the role of working memory (Baddeley & Hitch, 1974) in the solution of complex mental arithmetic problems. Each problem involved three operations (combinations of the operations of addition and subtraction) and four operands. The problems were presented in four different arithmetic notations, namely, (a) algebraic: (9 + 1) - (3 + 2), (b) reverse-Polish notation: 9 1 + 3 2 + -, (c) Polish-prefix notation: - + 9 1 + 3 2, and (d) a modified reverse-Polish notation: 9 1 3 2 + + -. The elements of the problems were presented one at a time and in serial order.

The results of Experiments 1-4 suggest that arithmetic notation affects the way in which information is retrieved and updated in working storage. Furthermore, the impact of arithmetic notation was seen in terms of utilizing the wrong operations and not in terms of loss of operand information. These results were interpreted as showing that the mental operations involved in the solution of the problems are dependent upon the organization (notation) employed to convey problem information.

The results of Experiment 5, which investigated speed of mental arithmetic, indicated that reaction times could be accounted for in terms of the number of different operations to be performed. That is, conditions that required the use of the same operations (always add or subtract) within a given problem were responded to much more quickly than conditions requiring the use of different operations (a combination of addition and subtraction). These results were interpreted in terms of interference of cognitive procedures in working memory.

The present research suggests that the working memory model proposed by Baddeley and Hitch (1974) needs to be modified in order to deal with such factors as the impact of stimulus features on the retrieval and updating of information in working storage. Furthermore, the present research points to an area of research in its infancy--the use of and interference from cognitive procedures in working memory. Working memory research should not only focus on the limitations of the system in terms of storage, but also of cognitive procedures.

## AN EXPERIMENTAL COMPARISON OF COOPERATIVE LEARNING TO NONCOOPERATIVE LEARNING AND THEIR EFFECTS ON COGNITIVE ACHIEVEMENT IN JUNIOR HIGH INDUSTRIAL ARTS LABORATORIES

Order No. DA8308765

**PERREAULT, RAYMOND JOSEPH, JR., PH.D.** *University of Maryland*, 1982. 170pp. Supervisor: Dr. Joseph Luetkemeyer

*Problem of the Main Study.* The problem of the study was to experimentally compare cooperative learning to noncooperative learning with regard to their effects on cognitive achievement at the knowledge, comprehension and application levels of Bloom's taxonomy in seventh grade industrial arts classes.

*Procedure for the Main Study.* Two junior high schools participated in the main study. Both teachers utilized the two experimental treatments. The randomly selected students from the available population were randomly assigned to the treatments at the class level. Reading comprehension and math problem solving scores from the "Iowa Tests of Basic Skills" were the measures of cognitive achievement. The data from these measures identified two comparable classes from both schools.

A technical advisory committee provided face validity to the treatment-specific- achievement instruments. The evaluative measures were designed to assess the dependent variables which were at the knowledge, comprehension and application levels derived from Bloom's taxonomy of the cognitive domain. The author incorporated a 2 x 2 randomized blocks design for each dependent variable. The factors were teacher A/ teacher B and cooperative learning/noncooperative learning treatments.

Both teachers were trained to utilize both learning techniques and the students used the thumbnail sketching activity as a practice exercise for their assigned treatments. The experiment lasted six weeks which consisted of drawing a metric 500 racecar.

*Findings of the Main Study.* Data from a two way analysis of variance for the main study indicated significant treatment effects in favor of cooperative learning at the knowledge level ($F$, (1,44) = 6.347, $P < .05$), and at the comprehension level ($F$, (1,44) = 5.483, $P < .05$). No significant treatment effects were found at the application level for both the researcher's drawing evaluations ($F$, (1,44) = .001, $P < .05$), and the teachers' drawing evaluations ($F$, (1,44) = 1.220, $P < .05$) however, significant teacher effects in favor of teacher A were indicated by the researcher's drawing evaluations ($F$, (1,44) = 5.264, $P < .05$), and significant teacher effects in favor of teacher B were yielded by the teacher's drawing evaluations ($F$, (1,44) = 8.165, $P < .05$). No interaction effects resulted in any of the analyses.

*Conclusions of the Main Study.* Data derived from main study indicated that cooperative learning increased achievement for the knowledge and comprehension variables as compared to noncooperative learning but no differences were found for the application variable.

## THE RELATIONSHIPS AMONG MENTAL IMAGERY, SPATIAL ABILITY, ANALYTIC-SYNTHETIC PROCESSING AND PERFORMANCE ON MATHEMATICS PROBLEMS

Order No. DA8323573

**PERUNKO, MARIE ANN, PH.D.** *University of Maryland*, 1982. 203pp. Supervisor: Dr. Neil A. Davidson

The purpose of this dissertation was to examine the relationships that mental imagery, spatial ability, and analytic or synthetic processing have to performance on mathematical problems which vary in the degree to which they involve visual-synthetic or verbal-analytic concepts and strategies.

Eighty-one community college students enrolled in developmental mathematics classes were given instruments measuring their use of visual and verbal imagery, their ability to rotate visual and verbal material, and their preference for analytic or synthetic processing of visual and verbal material. They were also given sets of mathematical problems which had been classified as verbal-analytic, visual-synthetic or combination problems.

The data were analyzed by means of factor analysis, regression analyses, and analysis of variance. The following relationship between the variables were found. The ability to rotate visual material and the analytic processing of visual material are related, but neither is related to the use of visual imagery. The use of verbal imagery and the analytic processing of verbal material are related, but neither is related to the ability to rotate verbal material. The uses of visual and verbal imagery are unrelated as are the abilities to rotate visual and verbal materials. However, the processing of both visual and verbal material in an analytic or synthetic fashion are correlated.

Students who are able to correctly rotate the visual figures and/or process the visual material analytically perform well on the visual and combination mathematics problems and solve the combination problems by a visual approach. Those students who are able to rotate the verbal material do well on the combination problems but use varied approaches.

Achievement on all three types of the mathematics problems are related. Furthermore, those students who do well on the visual and/or combination problems tend to use a visual solution approach.

Sex-related differences were found indicating that males score higher on the rotation and mathematics tests and in the visual mode, whereas females score higher on the use of imagery and analytic processing and in the verbal mode.

## A COMPARISON OF TREATMENTS FOR THE REDUCTION OF MATH ANXIETY AMONG EIGHTH GRADE GIRLS

Order No. DA8300322

**Peters, Carole Eswine,** Ph.D. *The Ohio State University,* 1982. 152pp. Adviser: Professor James V. Wigtil

This study was designed to investigate the effectiveness of four treatments for mathematics anxiety with a population of adolescent girls. Females were chosen because research indicates that math anxiety and math underachievement are much more common among females than among males. Four treatments were designed and then implemented with a sample of 48 eighth grade girls who reported that they felt anxious about math. The first treatment was tutoring, a condition which approximates a traditional educational approach to the remediation of underachievement in and anxiety about mathematics. The second treatment was self-instruction training, a technique which places emphasis on training subjects to use positive self statements as an aid in dealing more effectively with mathematics problems and situations involving the use of math. The third treatment combined self-instruction training with study-skills training, since study-skills training has been found to be effective in reducing test anxiety, especially when combined with another treatment approach or modality. The fourth treatment was a control group. Treatment groups met once a week during a study hall for eight weeks. Analysis of the results of pre- and post-tests indicated that differences on dependent measures before and after treatment were not great enough to be statistically significant, although changes on several of the measures did approach the .05 level of significance.

## LEARNING THE CONSERVATION CONCEPT: A META-ANALYSIS

Order No. DA8322983

**Phillips, Gary Wayne,** Ph.D. *University of Kentucky,* 1983. 113pp. Director: Dr. Edward Kifer

This study performed a Meta-analysis of Piagetian learning research on the concept of conservation. An effort was made to determine general trends in the data. These were: (1) whether preoperational children can learn conservation; and (2) whether some tutorial training methods are better than others in teaching the concept. In addition the meta-analysis examined the generalizability of the research by investigating the way outcome measures vary: on delayed posttests, on transfer tasks, with measurement criteria, age, sample size, and time between pretest and posttest.

The results of the meta-analysis indicated that generally tutorial training methods are effective at inducing the conservation concept. However, their effects tend to diminish over time (on delayed posttest). Furthermore, the effects of training transfer to other conservation classes. However, contrary to expectation, tutorial methods appear more effective when a strict (judgment plus explanation) criterion is used rather than a lenient (judgment) criterion. In addition, age, sample size, and time between pretest and posttest appear to be moderately confouding variables. Older preoperational children are more easily trained, larger effects are more likely to be found with larger sample sizes, and smaller effects are likely to be found for longer times between the pretest and posttest. These confounding variables were more influential on strict criterion measures. When these confounding variables were controlled, training method differences account for less variance in effect sizes on delayed posttests, but they accounted for more variance on the immediate posttest using a strict criterion. However, there was no training method consistently more, or less effective.

## INFLUENTIAL FACTORS IN THE DECISION TO ENROLL IN ADVANCED HIGH SCHOOL MATHEMATICS COURSES

Order No. DA8309467

**Pogatshnik, Lee Wolfram,** Ph.D. *Cornell University,* 1983. 244pp.

Previous research has indicated that high school girls do not elect as many advanced mathematics courses as do boys, and that this has been a cause of the lack of female participation in the sciences and in technology. This study was conducted to investigate those factors that affect the decision to enroll in high school mathematics courses and to determine if certain variables are more important to girls than to boys.

Ninth- and twelfth-grade students were surveyed in a set of questionnaires about their reasons for taking mathematics in high school. The relationship between several attitudinal variables and the decision to enroll in advanced mathematics courses was examined using a series of multiple regression equations.

The results of the study indicated that, contrary to the results of earlier studies, there was no sex difference in the amount of mathematics elected. The factors most salient to the decision to elect mathematics in high school were different for girls and boys. Girls who saw mathematics as useful for college and preferred college majors requiring mathematics preparation took more mathematics courses; boys who had more confidence in themselves as learners of mathematics took more mathematics. The degree to which students enjoyed mathematics was also somewhat important to all students.

There was also a sex difference in the influence of others' attitudes. For girls their teachers' encouragement was more important, for boys their fathers' encouragement and his belief that mathematics would be useful for college were more important. Their mothers' encouragement was not an important factor to girls or to boys; their peers' attitudes were somewhat important.

The results also revealed that although the girls enjoyed mathematics as much as the boys, performed as well in it, and were equally prepared in mathematics for college majors requiring mathematics, they still reported that they preferred female-dominated college majors that did not require mathematics. Thus to encourage women to pursue scientific or technological careers, maintaining equal participation rates of high school girls and boys in advanced mathematics courses will not be enough.

## A STUDY OF THE RELATIONSHIP BETWEEN PIAGETIAN CONSERVATION OF NUMBER TASKS AND THE ABILITY IN COUNTING OF YOUNG CHILDREN

Order No. DA8322125

**Prasitsak, Prapa Poowaton,** Ed.D. *University of Houston,* 1983. 98pp.

*Purpose*. The purpose of this study was to examine the relationship between Piagetian conservation of number tasks and young children's ability to count.

*Procedures*. The subjects were sixty-eight children, thirty-four boys and thirty-four girls, age 5 years 0 months to 7 years 6 months. Each child was tested individually by the experimenter on relational terms (more, same, and less), conservation of number, and three types of counting (rote, rational, and reproduction).

*Data Analysis*. Sixty-eight subjects were classified as conservers or nonconservers according to their performance on the test of number conservation. Conserver and nonconserver subjects were also categorized into counters or noncounters according to their performance on the test of counting. Yule's Q was used to analyze the data to examine the relationship between conservation of number and counting.

*Conclusions*. The results of the research showed that: (1) The subject who was a conserver can perform all three types of counting up to twenty. (2) Conservation does not occur until the child is at least 6 years old. (3) All sixty-eight subjects were able to understand the relational terms "same" and "more"; however, some of the subjects did not understand the meaning of "less." (4) It is not necessarily true that if the children can count they can conserve number. (5) Eighty-five per cent of the subjects between the age of 5 years 0 months and 7 years 6 months had the ability to perform the three types of counting up to twenty. (6) If the subject could rote count to 20, he/she could also rationally count and reproduction count to twenty. On the other hand, if the subject could not rote count to twenty, he/she could not rationally count or reproduction count to twenty. (7) There were no differences in the performance of number conservation tasks or the counting test between boy and girl subjects.

## RESPONSIBILITY FOR STUDENT ACHIEVEMENT AMONG SECONDARY SCIENCE AND MATHEMATICS TEACHERS AND ITS RELATION TO STUDENT ABILITY GROUPING AND SELECTED TEACHING STYLES

Order No. DA8316531

PRATT, DONALD LYNN, PH.D. *University of South Florida*, 1983. 232pp. Major Professors: H. Edwin Steiner, E. Ray Phillips

The purpose of the study was to compare teacher beliefs and verbal behaviors among secondary science and mathematics teachers. Teacher beliefs included two aspects of a teacher belief system: (1) teacher responsibility for student failure and (2) teacher responsibility for student success. Also included were four categories of teacher verbal behavior: (1) indirect behavior, (2) direct behavior, (3) praise, and (4) criticism. The following comparisons of teacher beliefs were made: science teachers with respect to mathematics teachers, junior high teachers to senior high teachers, and teachers of advanced classes to teachers of basic classes. The verbal behavior of teachers in advanced and basic classes were also compared. Finally, comparisons were made between verbal behavior and belief system.

The research samples were drawn from a target population of 42 secondary science and mathematics teachers. Belief system and observational data were obtained for 52 classes of these teachers. Observations were made on 17 teachers in advanced classes only, 8 in basic classes only, and 17 in both advanced and basic classes. There were 10 teachers selected from each of four areas--junior high science, senior high science, junior high mathematics, and senior high mathematics--so that teacher beliefs could be compared.

Only the advanced class-basic class comparisons produced any significant differences in teacher beliefs. None of the comparisons produced significant differences in either teacher use of praise or criticism. Advanced and basic class comparisons produced significant differences in both teacher beliefs and behaviors. Teachers of basic students assumed more responsibility for student success, assumed less responsibility for student failure, and were more direct in verbal behavior than teachers of advanced students. In comparisons of teacher gender, female teachers were significantly higher in incidences of indirect behavior and combined indirect-direct behavior.

Since the study used a non-experimental design, cause and effect of relationships was not determined. The following areas were suggested for future study: (1) teacher beliefs and verbal behaviors as evidence for the possible factors in "self-fulfilling prophecy" and (2) teacher gender as a factor in teacher verbal behavior.

## A STUDY OF THE EFFECTS OF ACTIVE PARTICIPATION IN INSTRUCTION UPON LEARNING

Order No. DA8310674

PRATTON, JERRY DEE, ED.D. *Portland State University*, 1982. 129pp. Adviser: Dr. John D. Lind

An experimental study of the effects of active participation on student learning was conducted with two levels of treatment of the independent variable. Intact groups were used because it was reasoned that results generated in classroom settings would likely be more generalizable to other classroom settings. The study was conducted in a medium-sized suburban school district mainly residential in character.

Five project teachers were trained to teach a lesson on simple probability. Each teacher taught four lessons to fifth grade classes, two with Treatment I (active student participation) and two with Treatment II (no active student participation). The lessons were alike in all possible respects except the treatment.

Immediately upon completion of instruction the students were administered a 15-item multiple choice posttest. The lesson and posttest were both researcher-developed instruments. The instruction and testing lasted about one hour for each class. The total number of students was 447.

The research hypothesis for the study was that the posttest mean of classes taught with active participation would be greater than the posttest mean of classes taught without active participation. The statistical hypothesis was stated as $\mu_1 = \mu_2$.

The results of a t-test were found to be statistically significant at the .05 level causing the statistical hypothesis to be rejected and the research hypothesis to be accepted.

From this study, it appears that teaching is more effective when active student participation is incorporated into the teaching method. Additional research is recommended to test the retention of the effect and to test the effect with different age groups.

## THE CORRELATES OF SUCCESS AMONG WOMEN IN MATHEMATICS AND MATHEMATICS-RELATED FIELDS: IMPLICATIONS IN EDUCATIONAL PROGRAM DEVELOPMENT

PRILLWITZ, BARBARA ELLEN, ED.D. *University of Southern California*, 1983.

*Problem*. The problem was to determine commonalities in perceptual and judgmental personality characteristics of women in mathematics and mathematics-related fields measured by the Myers-Briggs Type Indicator (MBTI) and to examine the attitudes and self perceptions as measured by a Life History Variable Questionnaire (LHV).

*Procedures*. Ninety-five women in mathematics and mathematics-related fields, who were members of the technical staff of the Aerospace Corporation in Southern California, were volunteer participants. They were given the MBTI and the LHV to complete and return by mail to the researcher. Five questions were formulated to test for commonalities in personality and life history of these women.

*Selected Findings*. These women were found to: (1) be from middle class urban families with professional fathers and working mothers; (2) have a recognized superior ability and inclination for mathematics by middle school; (3) have common personality characteristics of introversion and judgment (71%) on the MBTI; (4) share ISTJ (introverted, sensing, thinking judging) and INTJ (introverted, intuitive, thinking judging) as personality types on the MBTI; (5) found satisfaction in their careers.

*Selected Conclusions*. The women mathematicians in this study are characterized as: (1) coming from middle class families with working parents; (2) have early knowledge and ability in math; (3) were supported by parents, teachers, counselors; (4) preferred to think logically and look to themselves for solutions to problems; (5) comfortable with theoretical and analytic aspects of their work; (6) introversion and judgment were common personality characteristics; (7) were satisfied in career choice.

*Selected Recommendations*. (1) Early implementation of intervention strategies to detect and direct math ability for women; (2) dissemination of career possibilities for women in mathematics and mathematics-related fields; (3) further study on antecedents of mathematical ability in women and identification of women with mathematics ability.

(Copies available from Micrographics Department, Doheny Library, USC, Los Angeles, CA 90089.)

## THE USES OF MICROCOMPUTERS IN THE PUBLIC SCHOOLS WITHIN THE EAST TEXAS SCHOOL STUDY COUNCIL

Order No. DA8323503

PRICE, CHARLES ALDEN, ED.D. *East Texas State University*, 1983. 223pp. Adviser: Dr. Ruth Ann Stephens

The major purpose of this study was to present a description related to microcomputers in schools within the East Texas School Study Council (ETSSC) in the following categories: hardware and software available, uses, funding, literacy, training provided, and additional training needed.

The population was comprised of the principals within the ETSSC. A questionnaire that related to microcomputers was developed and validated. This questionnaire was mailed to the 422 principals within the ETSSC and returned by 279 (66.11 percent). The variables considered were the average daily attendance (ADA) ranges and the levels of schools.

The Apple II was the most frequently reported microcomputer; floppy diskettes were used more than other types of storage devices; printers were the most frequently reported peripheral device; the software was acquired most frequently from a computer vendor; the software was rated very good or acceptable; the teacher or teacher and principal selected the software most frequently; and the software selected almost or usually supported the goals of the school. Microcomputers were used by less than 40 percent of the principals; the most frequently reported uses of microcomputers were computer literacy and drill and practice; and math was the most frequently reported program that used microcomputers. Local funds were used most frequently to acquire microcomputers and almost all of the schools that had microcomputers purchased them. Close to one-half of the principals or their office staffs used microcomputers; and just over 30 percent of the principals had taken a college class related to microcomputers. Just over one-half of the personnel had received training in computer literacy, and just over one-fourth received training in subject matter or special software. Over one-half of the principals indicated a need for additional microcomputer inservice training.

The data from this study revealed the following: (1) Microcomputer hardware and software were available in all ADA ranges and levels of schools. (2) The principals in larger school districts used a microcomputer more than principals in smaller school districts. (3) Microcomputers were used in several programs; however, microcomputers were used more in the math program than other programs. (4) The funding sources used most frequently to purchase microcomputers were locally generated.

## AN EXPERIMENTAL COMPARISON OF THE EFFECTS OF HUTCHINGS' LOW-STRESS ALGORITHM AND THE CONVENTIONAL ALGORITHM FOR SUBTRACTION ON THE COMPUTATIONAL RATE AND ACCURACY OF ELEMENTARY SPECIAL EDUCATION STUDENTS Order No. DA8312167

QUAM, JOHANNA MARIE, PH.D. *University of Washington*, 1983. 172pp. Chairman: Professor James Q. Affleck

The two major objectives of this study were: (1) to analyze the changes in subtraction accuracy scores on entry test, posttest and two retention tests between two groups of learning disabled students, one group having received instruction in Hutchings' low-stress algorithm and one group having been taught conventional algorithm and (2) to compare the groups on differences in time to complete posttest and retention tests.

The subjects for this study included 20 public elementary school students enrolled in special education classes for students with specific learning disabilities. The students, ages 8 to 11, who met placement criteria, were randomly assigned to one of two treatment groups. They received training by the investigator for eight consecutive days.

Pupil performance data were collected on an entry test, and, following the training, on a posttest, and two maintenance retention tests administered at eight day intervals.

Analysis of the results showed that while experimental procedures were effective in improving the accuracy scores in computation for both groups, the ANCOVA and ANOVA with repeated measures revealed that the differences between the groups did not reach a level of significance on any of the outcome criteria, except for the measure of time to complete. This difference may have been accounted for by the slightly longer Hutchings' format. In conclusion, both treatments were effective in increasing the students' subtraction computational abilities, but the comparison did not indicate superiority for either method.

## INTERACTIVE COMPUTER GRAPHICS IN MATHEMATICS EDUCATION Order No. DA8301814

RAMBALLY, GERARD KRISHNARINE, PH.D. *University of Oregon*, 1982. 182pp. Adviser: David Moursund

The purpose of this study was three-fold. First, to design an interactive computer graphics system and discuss its utilization in solving secondary school mathematics problems. Second, to investigate the impact of such a computing facility on mathematics education. Third, to provide an overview of recent advances in computer graphics that may be beneficial to a potential user of computer graphics in education.

A machine independent, menu driven, interactive computer graphics system was designed with such capabilities as: plot and erase functions, and scatter diagrams; draw and erase points, lines, regions, circles and tangents to a curve; scale, rotate, translate, and reflect figures; move the cursor; calculate the midpoint, length and slope of a line segment; display the coordinates of points of intersection of curves; mix graphics and text; and specify a viewport.

Using this graphics system, methods were outlined for solving a variety of equations, systems of equations, inequalities, and systems of inequalities; selected problems involving the conic, linear, quadratic, and inverse functions; problems involving basic operations on vectors, and complex numbers; problems involving trigonometric identities; selected problems in differential and integral calculus; and selected problems in plane coordinate geometry, and transformation geometry.

The next stage of the research process focused on the impact of using the computer graphics approach on mathematics education. Some advantages and disadvantages of using this method were outlined, together with some new demands that the use of this method placed on the teacher, and on the student. Possible addition, deletion, and rearrangement of the order of presentation of certain topics from the curriculum were enumerated.

In order to provide the prospective user of computer graphics in education with the necessary background, some recent advances in computer graphics hardware (display and input devices), and software (character generation, geometric modeling, and algorithms) were outlined. The standard functions in general purpose graphics packages were also discussed and some factors to consider when evaluating graphics software were enumerated.

Finally, a pilot study was conducted with mathematics teachers, in order to determine whether the computer graphics approach is a viable alternative for teaching selected topics in secondary school mathematics.

## AN INVESTIGATION OF SEX DIFFERENCES IN CAUSAL ATTRIBUTIONS FOR MATH PERFORMANCE

Order No. DA8312943

RAPOPORT, FRANCES ROSEMARY, PH.D. *University of California, Berkeley*, 1982. 118pp.

Deaux's (1976) model of sex differences in attributions in an achievement situation proposes that females have lower levels of expectancy of success than males. As a consequence males and females are predicted to have differing patterns of attributions. Specifically, females should use good luck or effort following success and poor ability following failure. Males are predicted to use ability following success and bad luck following failure.

Achievement in mathematics was selected in order to demonstrate the validity of Deaux's model, since males and females achievement in math varies differentially over grade level (Maccoby & Jacklin, 1974). Females' math achievement is reported to be equivalent to males' math achievement prior to seventh grade, but lower after seventh grade. It was assumed that this would give rise to differential expectancies of success in math for males and females after seventh grade only.

Thirty male and thirty female students at the 3rd, 5th, 7th, 9th and 11th grades in a predominantly white, middle-class school district were given a questionnaire to assess their expectancy of success, as well as attributions and feelings following both success and failure in math. For comparison, the same rating scales were administered for expectancy of success, attributions and feelings pertaining to English.

The results show that there were no significant sex differences in expectancy of success in math, nor in attribution patterns before seventh grade (as expected). However, there were no significant sex differences in expectancy of success nor in attributions following 7th grade, contrary to the hypothesized result. Attribution to effort was the most common choice following success, and to a lack of effort following failure, for both males and females. The results for English were similar. The results of this study do not support Deaux's model. Additional analyses revealed that there was no significant sex difference in math or English achievement at any grade level. Predictions regarding feelings of pride and shame were made on the basis of Weiner's (1974) model. The results do not conform to his predictions.

Because no immediate outcome experience was provided upon which subjects could focus, it was suggested that the procedure facilitated the use of recall, decreasing subjects defensiveness, thus enabling the results to fit a "rational" model of attributional choice.

### INCREMENTAL, CONTINUOUS-REVIEW VERSUS CONVENTIONAL TEACHING OF ALGEBRA

Order No. DA8322883

REED, BEVERLY WOODS, ED.D. *University of Arkansas*, 1983. 82pp.
Major Professor: William E. Klingele

The study was designed to compare the achievement differences between students taught algebra by the Incremental, Continuous-Review approach developed by John Saxon and those taught algebra by a conventional approach. It was also designed to compare the attitude toward mathematics of the two groups.

An experimental between-groups design was utilized. The achievement of the two groups was compared with the analysis of variance technique. Scores from a departmental final examination and the Basic Algebra Test (developed by the Mathematical Association of America) were used as dependent variables. The difference in attitudes between the two groups was compared with the analysis of variance technique. The difference in attitudes within the groups was compared utilizing the dependent t-test. The Shatkin Mathematics Opinionnaire was administered at the beginning and end of the semester to measure student attitudes.

Students enrolled in Remedial Mathematics 1033 at the University of Arkansas in Fayetteville for the 1982 fall semester were divided into two groups. The odd-numbered sections, the experimental group, were taught using the Incremental, Continuous-Review approach and the even-numbered sections, the control group, were taught using a conventional approach. The instructors were assigned using normal assignment procedures without knowledge of the instructional methods.

At the end of the semester, the experimental group significantly out-performed the control group on both the departmental final examination (.001) and the Basic Algebra Test (.05). The experimental group scored significantly higher at the beginning of the semester than did the control group on the attitude inventory (.05). There was no significant difference between the groups at the end of the semester on the attitude inventory.

### AN ANALYSIS OF MULTIPLICATION COMPUTATION ERRORS OF HIGH-SCHOOL LEARNING DISABLED AND REGULAR-CLASS STUDENTS

Order No. DA8309369

REGAN, MADELYN K., ED.D. *University of Kansas*, 1982. 334pp.

To date, no research has investigated learning disabled students' computation skill performance past the junior-high level, although experts in learning disabilities have recognized the persistence of computation skill deficiencies into high school. This study investigated and compared the occurrence and types of computation error patterns in multiplication made by high-school learning disabled and regular-class students.

Forty-nine learning disabled and 49 regular-class students were selected as subjects through application of the Bayesian sampling procedure proven effective for identifying previously nonidentified learning disabled populations in secondary settings. Subjects were asked to compute ten multiplication tests designed to measure independent ability to compute multiplication problems ranging in difficulty from one-digit multipliers to three digit multipliers, with and without renaming, and zeroes. Errors were examined for computation error types, persistence of error, sequential position of the problem in which errors were made, and cross-multiplication errors by digit categories and level of multiplication difficulty. The research design employed the following statistical analyses: the Fisher's Exact Test, the Pearson Chi-square, and analysis of variance and covarience including repeated measures.

Results indicated that the learning disabled students committed significantly more errors in many of the categories. Even when significant differences were not found between the two groups, the learning disabled students made consistently more errors. Overall, an examination of the types of multiplication computation errors committed by the learning disabled students indicated that they lacked total mastery of basic multiplication operations, and that they consistently used ineffective and inefficient procedures for solving multiplication problems. Implications of the present investigation are drawn for the mathematics instruction of learning disabled adolescents.

### A STUDY OF THE EFFECTS OF BILINGUAL INSTRUCTION AND SELF-REVIEW ON ACHIEVEMENT IN ELEMENTARY DESCRIPTIVE STATISTICS BY SPANISH-SPEAKING BILINGUAL STUDENTS AT THE INTERMEDIATE SCHOOL LEVEL

Order No. DA8307695

REID, MARIA ARCHER, PH.D. *New York University*, 1982. 259pp.
Chairman: Professor Edward M. Carroll

*Purpose*. The purpose of the study was to investigate the effects of bilingual instruction and self-review on achievement in elementary descriptive statistics by Spanish-speaking bilingual students at the intermediate school level.

*Method*. The subjects in the study consisted of 232 Spanish-speaking bilingual students in grade eight enrolled in five intermediate and junior high public schools in two districts in New York City.

There were four experimental classes of 109 Spanish-speaking bilingual students from ASPIRA Consent Decree bilingual programs and six control classes of 123 Spanish-speaking bilingual students. Two of the control classes were from bilingual programs and four classes were from the regular English-speaking programs in the schools.

The computation subtest of the Stanford Diagnostic Mathematics Test, Form A, Brown Level was administered as a pretest. All students were taught selected topics in basic statistics and graphs for 15 teaching days. Students were provided color-coded worksheets and study sheets on the content material written by the researcher; Spanish for the experimental group and English for the control group.

At the end of the treatment a statistics test (posttest 1) was administered to all students; the test was available in Spanish and English. Four weeks after the end of the treatment, posttest 2 was administered to all students. There was no discussion of the experimental material during the four weeks prior to posttest 2. One half of each experimental and control class self-reviewed for one class hour prior to posttest 2. The self-review material was written in Spanish and English.

*Results*. Analysis of covariance was used to test three major hypotheses at the $p = .05$ level of significance. It was found that: (1) Spanish-speaking bilingual students achieve at a higher level, when taught selected concepts in statistics in a bilingual program. (2) Spanish-speaking bilingual students retain significantly more material, if they self-review selected concepts in statistics, when taught in a bilingual program. (3) Spanish-speaking bilingual students do not retain significantly more material, if they do not self-review selected concepts in statistics, when taught in a bilingual program.

It was also noted that both the experimental and control self-review groups did not perform significantly better than the no-self-review groups; and that there were no sex-related differences in achievement in selected statistical concepts.

### A COMPARATIVE STUDY OF THE COMPETENCY LEVEL OF BASIC SKILLS FIRST TEACHERS IN THE CRITICAL COMPETENCY AREAS AND STUDENT ACHIEVEMENT GAINS

Order No. DA8316347

REYNOLDS, JOLETA MCDOWELL, ED.D. *Memphis State University*, 1983. 158pp. Major Professor: W. Elzie Danley, Sr.

This study was an investigation of the relationship between the competency level of Tennessee Basic Skills First teachers in identified critical competency areas and student achievement. Principals, teachers, and State of Tennessee Department of Education staff were asked to rate the perceived level of teacher competency as noted during the pilot year observation in each of the identified twelve critical competency areas.

Student achievement data used were the pretest data (Spring

1981) and posttest data (Spring 1982) for the pilot year collected from the use of the California Achievement Test or the Metropolitan Achievement Test. The methodological approaches involved an analysis of the responses of the teachers, principals, and State Department of Education staff members and a combination of ranking procedures utilizing test score means. It also involved a correlation analysis of the responses from teachers, principals, and State Department of Education staff members. The commonly used Pearson Product-Moment technique and Kendall's Tau were utilized in making the analyses.

The following findings resulted from the analyses of the data collected for this investigation. (1) There was no high positive correlation among the ratings of the competency level of teachers by the three respondent groups. (2) Intergroup relationships among the ratings of the competency level of teachers indicated a "low negative" relationship. (3) There was no positive agreement among rankings on critical competencies as perceived by respondents for reading or mathematics. (4) There was not general agreement among the three groups in the perception of the competency level of teachers. (5) The perceptions of teachers tend to be more in agreement with the perceptions of principals than with the perceptions of State Department of Education staff. (6) None of the critical competencies seemed more important than any other.

## IDENTIFYING STUDENT ENTERING CHARACTERISTICS DESIRABLE FOR A FIRST COURSE IN COMPUTER PROGRAMMING Order No. DA8311865

RICARDO, CATHERINE MARY, PH.D. *Columbia University*, 1983. 201pp.

*Purpose*. The purpose of this study was to examine several variables that appeared to be related to success in a first course in computer programming on the college level. These were: (1) mathematical aptitude, measured by Scholastic Aptitude Test mathematics score; (2) verbal aptitude, measured by Scholastic Aptitude Test verbal score; (3) deductive reasoning, measured by one section of a programming readiness test constructed by the investigator; (4) persistence, measured by a second section of the test; (5) inductive reasoning, measured by the third section of the test.

*Method*. The preliminary version of the test instrument, called the Programming Readiness Test, was administered to 388 students beginning an introductory course in PL/1 programming at a private, suburban, liberal arts college. Scholastic Aptitude Test scores, three subtest scores, responses for the test items, year in school, sex, prior programming instruction, and type of major were recorded.

Each test item was analyzed, and intercorrelations of the three subtests were calculated. Reliability of the test was found using K-R # 20. The criteria used for establishing predictive validity were score on a common final examination and final grade. The total Programming Readiness Test score and the two Scholastic Aptitude Test scores were used in a regression equation to measure the contribution of each to prediction of the criteria.

The Programming Readiness Test was then revised, and data were collected and analyzed as in the previous study.

*Conclusions*. (1) Analysis of the data demonstrated that all five variables are significant predictors of success in the programming course, using either criterion. (2) Correlations between other variables recorded and criteria were too small to be of interest. (3) There was considerable intercorrelation among the five predictor variables. (4) Regression analyses yielded a multiple R of .63 using final examination score as the criterion, and .56 using final semester grade. (5) Analysis of the dropout group showed that this group scored below the rest of the sample, but the differences were significant only for the total score on the revised Programming Readiness Test.

## AN INVESTIGATION OF THIRD AND FOURTH GRADE STUDENTS' UNDERSTANDING OF A DECOMPOSITION SUBTRACTION ALGORITHM BASED ON INDIVIDUAL INTERVIEWS Order No. DA8320135

RICKMAN, CLAUDE MEREDITH, ED.D. *University of Georgia*, 1983. 217pp. Director: William D. McKillip

A stratified random sample of 16 third and 16 fourth grade students was assigned equally to four groups for each grade: high mathematics-high verbal, high mathematics-low verbal, low mathematics-high verbal, and low mathematics-low verbal groups. Individual interviews consisting of (1) a prerequisite task, (2) a think aloud task, (3) a textbook interpretation task, and (4) a concrete manipulation task were designed to reveal the nature of students' understanding of a decomposition subtraction algorithm for whole numbers. Analyses of the data were descriptive and chi square was used to test for significant relationships. Five objectives were addressed in this study. Results of the analyses show: (1) Only 45% of third graders' responses and 66% of fourth graders' responses to prerequisite test items were correct. Frequencies of responses were significantly related to mathematics achievement. (2) All but two fourth graders gave nonmeaningful spontaneous explanations of the decomposition algorithm. Only 4 of 16 third graders and 9 of 16 fourth graders gave verbal evidence of some meaning for the agorithm when responding to probing questions. (3) Knowledge of place value concepts were prerequisite for giving meaningful explanations of the decomposition subtraction algorithm but was not significantly related to the frequencies of meaningfulness categories. Knowledge of regrouping tended to be significantly related to meaningfulness of explanations of the algorithm. Conservation of the minuend during regrouping was not significantly related to meaningfulness of explanation of the algorithm. (4) Fifty two percent of responses to a textbook page interpretation task were correct. Significant relationships were found between a regrouping item and mathematics achievement levels. Regrouping item responses were most frequently incorrect of all responses elicited. (5) Neither third nor fourth graders tended to be successful at modeling the algorithm with manipulative materials. Ability to model regrouping of 1 hundred to 10 tens was significantly related to an item of the prerequisite test assessing the same understanding.

## THE IMPACT OF THE INSTRUCTIONAL GAME *EQUATIONS* UPON MATHEMATICS ACHIEVEMENT OF MIDDLE-SCHOOL STUDENTS Order No. DA8324272

RICKS, JAMES DAIGH, PH.D. *The University of Michigan*, 1983. 243pp. Chairman: William D. Coats

During the past several decades, classroom teachers have made growing use of educational games in the classroom. One such mathematics game, EQUATIONS, has become increasingly popular as an extra-curricular school activity and is being used by a limited number of teachers in the middle-school classroom.

While EQUATIONS is one of the most studied educational games available to the classroom teacher, attention has not previously been focused on its impact upon basic skills achievement when practiced in the classroom. Basic skills achievement is a major priority in most schools today and assessment of the game's impact upon basic skills was deemed important to the future acceptance of the game in the classroom.

The main core test of the Michigan Educational Assessment Program 10th Grade Mathematics test was administered to experimental and control groups of players and non-players in four schools to assess the impact of weekly use of the game upon basic skills. Three of the four schools, involving 130 seventh and eighth grade students, were included in the study.

An examination of the mean gains of control and experimental groups was conducted on the main core test and four sub-tests related to mathematical content of the game. In addition, performance differences between sexes were investigated. One-way analysis of variance, two-way analysis of variance and t-tests were employed to investigate differences between groups.

Although differences in gains were found in the hypothesized direction, analysis of data revealed no statistically significant differences in performance between players of the game and non-players. Females, however, were found to have significantly outperformed males in the experimental groups while these differences did not exist in the control groups.

Due to the study's focus upon the effects of the game as it is currently practiced, variables entered in which may have adversely affected experimental group performance. Suggestions were made to eliminate problems associated with these variables in future studies. Higher experimental group gains at two test sites, considered in light of these variables suggest that performance differences might be greater in favor of game players in future studies.

### LINGUISTIC BARRIERS TO STUDENTS' UNDERSTANDING OF DEFINITIONS IN A COLLEGE MATHEMATICS COURSE

Order No. DA8300632

RIN, HADAS, PH.D. *University of California, Berkeley*, 1982. 275pp.

This study investigates students' understanding of defined concepts in a first course involving deductive mathematics. At UC, Berkeley, there is a sophomore course on linear algebra where, for the first time, students must pay serious attention to definitions. I have examined in detail how they cope with this problem. Inadequate understanding of the formal definitions by which concepts are introduced is a major source of difficulty for students in this course. In many instances, the assigned problems require the ability to "work literally from" definitions, but the flawed writing of students makes clear that the language of definitions is too "foreign" to enable them to proceed. This study's analysis of the flawed utterances of students points to significant ways in which their understanding of course concepts and language differs from that of their instructors. In fact, students are found to comprehend inadequately some of the most primitive notions connected with mathematical definitions.

At the same time, aspects of pedagogical practice are identified which bear on the difficulties experienced by students. In particular, I explicate various tacit assumptions which underlie mathematical discourse, and present evidence suggesting the extent to which these assumptions are unwarranted for the student audience of concern. As a result, a textbook author's intention is not transmitted to students, and they miss certain kinds of information. In turn, because students do not abide by many of the mathematician's conventions, their own writing is often misinterpreted or remains uninterpreted by instructors. I argue that the deficiencies reflected in students' linguistic misbehaviors--an unattended matter in instructional design--impede their apprehension of the objects investigated and their comprehension of defined course notions. The same deficiencies interfere with their handling of problem-solving assignments.

The results reported are based partly on an analysis of work written by students in response to the study's questionnaire items. Findings rest also on interpretations of tape-recorded interviews with students, of which excerpts are transcribed here. In both cases, the aim has been to probe for the presence of specific aspects of the understanding of course definitions.

Based on the study's findings, ways of enhancing communication in a first deductive course are discussed in detail.

### INTEGRATED GOAL STRUCTURING IN THE ELEMENTARY SCHOOL: COGNITIVE GROWTH IN MATHEMATICS

Order No. DA8301603

ROBERTSON, LAUREL DAWN, ED.D. *Rutgers University The State U. of New Jersey (New Brunswick)*, 1982. 94pp. Chairperson: Maurie Hillson

This study compared the cognitive effects of a mathematics program which utilized an integration of cooperative, competitive, and individualistic goal structures, with a program which utilized the traditional structures of competition and individualization. The subjects, 166 students in eight second/third combination classes, were divided into three groups: (1) two classes, 45 students, in which the teachers used integrated goal structures, with cooperation the basic technique; (2) three classes, 64 students, in which the teachers used competitive and individualistic structures; and (3) a control group of three classes, 57 students in which the teachers taught in their usual manner. Five teachers, who had received previous training concerning the use of goal structures, were randomly assigned to the two experimental groups. The three control group teachers had received no previous instruction concerning goal structures.

A list of mathematics objectives was generated by the teachers. A pretest/posttest instrument was developed to correspond to the objectives at each grade level. Reliability studies were conducted and demonstrated the acceptability of the instruments.

A quasi-experimental, pretest-posttest non-equivalent groups design was used. The subjects were pretested and an ANOVA was used to establish the equivalence of the groups at each grade level. During the six week experimental period, students received the specified treatments in mathematics for approximately 30 minutes daily. The students were posttested and ANOVAs of posttest scores and gain scores were computed. Neither the mean possttest scores nor the mean gain scores differed significantly at either grade level. Although the use of integrated structures did not prove to be more effective in promoting cognitive growth in mathematics, it was not proven less effective. Additional research concerning the integration of goal structures is needed.

### A CRITERION REFERENCED INSTRUMENT OF FUNCTIONAL MATHEMATICS SKILLS IN MODERATELY AND SEVERELY RETARDED ADULTS

Order No. DA8311450

ROBINSON, DONNA REGINA, PH.D. *Kent State University*, 1982. 203pp. Director: Carl Spies

A working knowledge of premath and mathematics concepts would prove to be very advantageous for the MSPR adult client since so many workshop jobs draw heavily on this type of skill. There are few assessment tools and curricula which are suitable for this group. The inappropriateness of norm referenced tests for this population is well documented. Tests are needed that are tied to relevant domains and that use recent research findings in the area of teaching the retarded. The purpose of this study was to develop a criterion referenced test of functional mathematics skills which could be used with moderately and severely retarded adults.

In mapping out the domain, objectives were generated and categorized into 11 subtests. Item specifications were written and submitted to a panel of judges for deletion or revision to insure content validity. Item mortality was much less than had been anticipated, which resulted in the instrument being much lengthier than had been expected.

The test was piloted and then administered to 34 sheltered workshop clients who had passed a screening Pretest. Statistical analyses were done to assist the writer in restructuring and in shortening the instrument. Factors such as relative importance of content and the structure of the domain was also considered in making revisions.

Concurrent validity was established by correlating subtest scores with teacher ratings. Factor analyses on selected objectives and on the set of subtest scores supported the construct validity of the instrument. Item analyses for each subtest were completed by computing point biserial correlations between the item score and the respective subtest score. The reliability measure used was Subkoviak's coefficient of agreement for criterion referenced tests. Values ranged from a low of .75 to a high of .99.

To enhance utility, the instrument needs to be scaled down. In cases where many items were contained within an objective, stepwise multiple regressions were run. Item scores were used to predict objective scores. These results suggested redundant items that might be deleted. The test appears to validly and reliably cover relevant premath and mathematics content as it applies to the adult MSPR workshop client.

### COMPUTER SCIENCE EDUCATION IN SMALL LIBERAL ARTS COLLEGES: STATUS AND IMPACT ON THE CURRICULUM

Order No. DA8313592

ROSE, JUDITH, ED.D. *The University of Rochester*, 1983. 125pp.

A questionnaire survey of 628 small, liberal arts colleges was conducted to assess the status of computer science programs, their impact on the curriculum, and to discern procedures and problems related to implementing such a program. Responses from 411 schools revealed that 157 offered a major and 218 a minor in computer science. This reflects a significant computer science curriculum expansion over the past few years. A programming language course was offered by 92% of all responding schools--the most widely offered being BASIC which is available at 353 schools. Pascal, first offered in 1975, is already being offered by 44% of responding colleges. A course in computer literacy (with widely varying content) is offered by 284 colleges.

The offering of the computer science major appears to be associated with larger-than-average size, higher male enrollment, higher mathematics SAT scores and higher tuition. No such associations are found with respect to the computer science minor.

The average numbers of students in the major and minor programs, 24 and 6 respectively, suggest that so far, most schools have had only limited success in using computer science to attract students. It is interesting to note that Business was the program that attracted by far the greatest number of majors at over 60% of responding schools.

Follow-up telephone interviews with a random sample of respondents indicated that most schools are resigned to paying the salary premium necessary to attract computer science faculty and few are looking for alternative funding methods. These schools had designed programs for traditional undergraduates and thus far, had seen no change in the type of student usually attracted by a liberal arts college. The majority of programs, however, are less than three years old.

## A STATUS STUDY OF MATHEMATICS EDUCATION IN ADULT BASIC EDUCATION

Order No. DA8303715

Ross, Kenneth Scott, Ed.D. *The University of Tennessee*, 1982. 95pp. Major Professor: Donald J. Dessart

The purpose of this study was to determine the current national state-of-the-art in teaching Adult Basic Education (ABE) mathematics and to generate testable hypotheses from data grounded in the results of the survey instruments and the literature of ABE. The teachers and students of the Knox County, Tennessee ABE program were surveyed for this study.

The data were collected from students and teachers who agreed to participate in the study. The data were then analyzed by a computer. Crosstabulations of the responses were done with the demographic data. The review of the literature revealed a paucity of completed research in the area of mathematics education in ABE. It was found that less than one third of the ABE students surveyed had ever used a calculator. The teachers averaged fewer than two adult education courses in their professional preparation. The teachers felt workshops are the most useful source of information about new developments in education.

The main conclusions emerging from the study were that curriculum specialists of both mathematics and Adult Education at the university level have failed to give proper attention to the adequate preparation of teachers who teach mathematics in ABE programs. Federal and state expenditures in ABE have not been used to develop professional incentive plans for teachers in ABE; i.e., professional incentive plans which promise career advancement and security. Passing the General Education Development examination is the primary objective educators teach for rather than developing literacy skills.

## AN EXPERIMENTAL STUDY TO INVESTIGATE THE EFFECTS ON ACHIEVEMENT OF SIXTH GRADERS IN MATHEMATICAL PROBLEM SOLVING USING TEXTBOOK PROBLEMS COMPARED TO PROBLEMS CONSTRUCTED BY THE TEACHER

Order No. DA8301172

Roth, Duane Dennis, Ed.D. *University of Northern Colorado*, 1982. 144pp.

*Purpose of the Study*. The purpose of this study was to investigate the effects on achievement of problem solving using textbook word problems compared to nonroutine personalized word problems constructed by the teacher.

*Procedures*. All subjects were instructed using the same mathematics textbook but word problems constructed by the teacher-researcher of this study were utilized in the experimental groups in place of textbook word problems.

*Treatment of the Data*. Analysis of variance was utilized to detect any significant differences of the data collected from the pre and posttests. Tests used in this study were: *Iowa Tests of Basic Skills, Dutton Arithmetic Attitude Scale*, and the *Arnold Problem Solving Test*.

*Findings*. No significant differences were found on the pre-tests administered.

No significant differences were found on the post-tests in the following: achievement in computation, attitude in mathematics, and achievement of problem solving ability.

Comments from students of the experimental group that frequently occurred concerning teacher-constructed problems were: (1) more interesting; (2) more challenging; (3) more relevant; also, textbook word problems are: (1) boring; (2) too easy, require no thinking to solve them.

*Implications*. General implications drawn from this investigation: (1) Spending more time on problem solving activities does not appear to lower students' ability in achievement on computation. The experimental group spent approximately one and one-half class periods more a week on problem solving activities yet no significant differences resulted on computation. (2) More time spent on problem solving activities may result in an increase in students' attitudes towards mathematics. The extra time, mentioned in implication 1, spent on problem solving did not seem to produce significant differences in attitude toward mathematics. However, the observation of the researcher was that extra time spent on problem solving did not produce the usual "moans and groans" traditionally associated with written problems. (3) Achievement in problem solving may not be significantly different using teacher-constructed problems; however, when a new concept is used, traditional tests may not detect significant differences which may have actually occurred in the experimental group. (4) The experimental groups' comments suggest a preference for solving teacher-constructed word problems rather than traditional textbook word problems.

## MATHEMATICAL VARIABLES RELATED TO COMPUTATIONAL ESTIMATION*

Order No. DA8306935

Rubenstein, Rheta Norma Pollock, Ph.D. *Wayne State University*, 1982. 214pp. Adviser: John S. Camp

*Statement of the Problem*. In this exploratory study, computational estimation performance in four dimensions and its relationship to several mathematical variables were studied. Research questions focused on differences in students' performance of computational estimation related to attributes of the items and identification of mathematical skills related to computational estimation.

*Methodology*. An Estimation Test was developed to measure four types of computational estimation: open-ended, reasonable vs. unreasonable, reference number, and order of magnitude. The test was balanced in four dimensions: type, form, number, and operation. The items were presented on an overhead projector and individually timed. A Related Factors Test was developed to measure achievement in selecting operations, making comparisons, knowing number facts, operating with tens, operating with multiples of ten, knowing place value, rounding, and judging relative size. The Problem Solving Test of the Iowa Problem Solving Project measured getting to know the problem, solving the problem, and looking back. Other variables were general mathematics achievement and sex. Subjects were 309 eighth grade students in seven southeastern Michigan school districts. Analysis of variance and multiple regression were used to study the relationships among the variables.

*Conclusions*. Students performed differently on three types of estimation. The order of difficulty from easiest to hardest was: order of magnitude, reference number, and open-ended. Decimal number items were harder than whole number items. Division was the hardest operation, multiplication the next most difficult, and subtraction and addition were equally least difficult. Boys did better than girls on total computational estimation and order of magnitude estimation. There were no statistically significant differences between the sexes in performance of open-ended or reference number estimation.

In a stepwise multiple regression, total estimation was explained by operating with tens, making comparisons, and getting to know the problem. Open ended estimation was explained by operating with tens, solving the problem, and making comparisons. Reference number estimation was explained by judging relative size and operating with multiples of ten. Order of magnitude estimation was explained by operating with tens, making comparisons, looking back, and sex.

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## EFFECTS OF MULTIGRADE GROUPING ON ELEMENTARY STUDENT ACHIEVEMENT IN READING AND MATHEMATICS

**Order No. DA8315672**

Rule, Judy Gayle, Ed.D. *Northern Arizona University*, 1983. 126pp. Adviser: Dr. Jim Davis

The purpose of this study was to investigate the effects of multigrade classes on student achievment in reading and mathematics. In addition, the achievement of students in differing ability groups and in the upper and lower grade level of a multigrade class was analyzed.

The sample comprised 3,360 students in grades three through six in twenty-eight schools in the Mesa Unified School District. All of the students had California Achievement Tests for the 1980-81 and 1981-82 school years. Students were in one of three groups: multigrade classes, single-grade classes in schools with multigrade classes, or in single-grade classes in schools without multigrade classes. Analyses included a one-way analysis of variance on achievement scores.

The results indicated one significant difference for reading with multigrade scores higher than single-grade, five significant differences for mathematics with single-grade scores higher than multigrade for four of the five analyses, and one significant difference for mathematics within the multigrade classes with the lower-grade scores higher than the upper-grade. More significant for practitioners were these implications: (1) Multigrade classes did not appear to affect reading achievement negatively. (2) Student mathematics achievement might be negatively affected by placement in multigrade classes. If using multigrade classes, teachers should pay particular attention to mathematics instruction. (3) The effects of multigrade classes at specific grades were inconclusive, though mathematics appeared to have been affected more negatively than was reading. (4) If using multigrade classes, the average/high placement appeared to be best for all grades for reading and for grades four, five, and six for mathematics. (5) The upper or lower grade assignment in a multigrade class did not appear to affect reading achievement; the lower grade assignment had a positive effect on mathematics achievement.

## CONDITIONAL LOGIC PROBLEM SOLVING: DEVELOPMENTAL RELATIONSHIPS AND THE ROLE OF CONTENT INTERFERENCE

**Order No. DA8318288**

Rycek, Robert Francis, Ph.D. *Northern Illinois University*, 1983. 181pp.

Previous research on conditional logic problem solving has suggested (1) that it is related to formal operational development and (2) that performance may be affected by non-logical factors. These studies suggest that there may be a correspondence in the development between certain formal operational abilities and conditional reasoning. It has also been suggested that subjects' performance on conditional logic tasks may be influenced by the content elements of a logical syllogism which interfere with logical reasoning processes.

The present study examined the relationship between performance on formal operational tasks and conditional logic problem solving. It was hypothesized that certain formal operational abilities would correspond to the development of conditional reasoning. Factors influencing conditional logic problem solving were also examined using a rule production task which provided different levels of content interference. It was hypothesized that as the degree of content interference increased, logical reasoning performance would decrease under most conditions.

Concrete and formal operational level college students were administered three cognitive tasks (tokens, pendulum, and balance) and a series of conditional logic problems. In the conditional logic task, subjects were given a set of cards which defined a particular conditional relationship. Subjects were provided with either a suggested rule, a partial rule, or no rule for each set of cards. The subjects were required to determine a rule, predict the outcomes of the rule, test the rule, and prove the rule. Other factors which were manipulated included problem type (use of negations) and problem dimensionality (number of antecedents and consequents).

The results indicated that there was a relationship between formal operational development and conditional reasoning which suggested that formal operations is necessary but not sufficient for conditional reasoning. The content interference hypothesis was also supported in that subjects who were provided with a rule tended to make more matching responses and errors than subjects in other conditions. However, content interference was found to interact with other factors. The results suggested that content interference can have both detrimental and facilitating effects on conditional logic problem solving.

## SUPPLY AND DEMAND FOR TEACHERS OF PHYSICS/CHEMISTRY, MATHEMATICS, SPECIAL EDUCATION, AND SOCIAL SCIENCE IN KANSAS, 1975-1982

**Order No. DA8317952**

Ryoo, Wan Yung, Ph.D. *University of Kansas*, 1983. 145pp.

Educators are concerned about a teacher shortage in the middle or late 1980s, especially in the areas of science and mathematics teaching. Some of the researchers have indicated that a shortage of science and mathematics teachers had already occurred in their states.

The main purpose of the study was to determine the balance of the teacher supply and demand in the physics/chemistry, mathematics, special education, and social science areas in Kansas. This study projected teacher populations of each subject area in 1985 and in 1990 using a modified cohort component method. Information was also gathered on the aging and sex composition trends of teachers in each subject area based on data provided by the Kansas State Department of Education.

The total number of special education teachers has increased every year of the study. In the other three areas, the number of teachers declined until the late 1970s, and started to gain thereafter through 1981-82. A trend toward teacher aging was apparent in all subject areas except for special education. The average composite survival rates ranged from 84.4 to 87.8 percent. Generally, the survival rates for 29 years olds and below teachers were significantly lower than any other age group. Teacher shortage areas (physics/chemistry, mathematics, and special education) tended to attract more teachers from other subject areas and release less of their own teachers to other subject areas as a result of reassignments. In contrast, the teacher surplus area of social science exchanged the same number of teachers with other subject areas.

Physics/chemistry, special education, and social science teachers are projected to increase slowly through the 1990-91 school year while mathematics teachers are projected to decrease. Projected age distributions showed serious and continuous aging tends in all four subject areas.

## STUDY OF THE RELATIONSHIP BETWEEN ACCULTURATION AND ACADEMIC ACHIEVEMENT OF ARAB STUDENTS IN AN ELEMENTARY SCHOOL SETTING

**Order No. DA8306937**

Saab, Nouredine, Ed.D. *Wayne State University*, 1982. 114pp. Advisers: Dr. Anga Youssef, Dr. Rodolfo Martinez

The purpose of this study was to determine whether: (1) the acculturation of Arab children, number of schooling years, age, parental attitudes and achievement were significantly related, (2) the acculturation correlates more highly with academic achievement than do the other variables, (3) the acculturation and achievement were more significant for boys than for girls.

The sample population for this study was a randomly selected group of 44 students in the third, fourth, and fifth grades representing a population of Arab children who met the following criteria: (1) they spoke English, Arabic or both languages, (2) they spent at least three years in American schools, (3) their parents were new immigrants.

The Iowa Tests of basic skills was used to measure achievement in the areas of math and reading. A questionnaire was developed to determine the acculturation aspects.

The Teachers Observation Survey was used to measure teachers' perception of their students.

Data from the aforementioned test and surveys were subjected to two types of data analysis: The Pearson Product Moment Correlation Coefficient and the Multiple Regression Analysis.

Findings showed there were statistically significant correlations between academic achievement in the areas of math and reading and the following variables: age, number of schooling years, sex, the adaptation of American values and the teacher's perception of children. There was also a statistically significant difference between boys and girls in the areas of achievement and acculturation.

It was concluded: (1) The process of directing the curriculum toward the language of the dominant culture does not have any positive relation with achievement. (2) The orientation toward two languages and two cultures would be feasible and desirable.

### A STUDY TO INVESTIGATE WHETHER NAVAJO SPECIAL EDUCATION ELEMENTARY STUDENTS DEVELOP DIFFERENCES IN COGNITIVE ABILITIES FROM REGULARLY PLACED NAVAJO ELEMENTARY CHILDREN

Order No. DA8305290

SACKS, BERNARD, ED.D. *Northern Arizona University*, 1982. 172pp. Adviser: Dr. Hagelberg

This study determined whether Navajo learning disabled (LD) children aged seven through thirteen, differ in cognitive abilities from regularly (regular) placed Navajo children of the same ages. The sample was drawn from six areas on the Navajo Reservation. Ninety-six Navajo LD children and one hundred and thirty-nine regular Navajo children were tested with the Developing Cognitive Abilities Test, which was taped but not timed and given in the Navajo and English languages.

Group mean raw scores of the sub test of verbal, spatial and quantitative abilities were compared. Analysis of Variance among ages, between sexes and groups yielded significantly different mean scores between the Navajo LD and the Navajo regularly placed children with the LD scoring consistently lower, and t-tests were used to locate specific areas of difference.

The LD children scored lower significantly than regular children in overall cognitive abilities. It was concluded that the Navajo LD children have not developed overall cognitive abilities as effectively as regular Navajo children. LD Navajo children aged seven and eight scored lower than regular seven and eight year old Navajo children in verbal ability sub-test, Finding Causes. The conclusion drawn was that this ability is deficient among the LD children. LD Navajo children aged eleven, twelve, and thirteen scored lower than regular children the same ages in Excluding Information. The conclusion drawn was that this ability had not developed in the oldest Navajo LD children. In spatial abilities, Navajo boys aged seven and eight scored lower than Navajo girls the same age, in Pattern Extension. Navajo LD children aged seven through ten were unable to extend patterns as successfully as regular Navajo children the same ages. Pattern Extension is regarded as basic in certain reading programs. The seven and eight year old boys were less able in mathematical ability than girls the same ages. As Navajo children grow older the cognitive differences apparent at ages seven and eight become smaller. Early experiences with cognitive processing skills should be emphasized to decrease this discrepancy. Teachers must avoid making incorrect assumptions about how and what Navajo children think, and what they should have learned as opposed to what Navajo children actually know.

### MATHEMATICS ACHIEVEMENT AND ATTITUDE IN GRADES SIX THROUGH EIGHT IN LEBANON, OREGON

Order No. DA8313057

SAMUELS, WILLIS DEAN, ED.D. *Brigham Young University*, 1983. 186pp. Chairman: Lowell D. Thomson

Achievement in mathematics and attitude toward mathematics were measured for a sample of secondary school students in Lebanon, Oregon. Attitudes were measured by Aiken's Mathematics Attitude Scale, and achievement was measured by the Comprehensive Test of Basic Skills (CTBS).

Attitudes toward mathematics were positive rather than neutral and were positively correlated with achievement. Students in the sixth and seventh grades performed significantly better than the national average on the achievement tests; eighth grade students, however, did not.

A possible explanation for the average achievement scores of eighth grade students is that the test might have been biased toward students of modern mathematics. It is recommended that Lebanon retain its traditional mathematics curriculum because of the students' positive attitudes and the better-than-average achievement in grades six and seven. It is also recommended that additional tests of achievement be used to evaluate the eighth grade students.

### THE RELATIONSHIPS AMONG AGE, SEX, AND LEVEL OF COGNITIVE DEVELOPMENT TO MATHEMATICS ACHIEVEMENT AMONG SELECTED EMERGING ADOLESCENTS

Order No. DA8228725

SASS, MARGARET ANN, ED.D. *University of Georgia*, 1982. 91pp. Director: Charles E. Johnson

A primary purpose of this study was to investigate differences in mathematics achievement between emerging adolescents judged to be concrete or formal operational. Other purposes of this study were to investigate differences among age and sex in cognitive development and mathematics achievement.

Level of cognitive development was determined from results on three concrete operational tasks (conservation of number, area, time) and three formal operational tasks (pendulum, equilibrium in the balance, projection of shadows). Mathematics achievement was measured by the *Metropolitan Achievement Test*, 1978 edition, *Mathematics Instructional Test*, Intermediate level.

One hundred twenty students aged eleven through thirteen were administered the concrete operational tasks and *Metropolitan Achievement Test*. Students correctly answering all concrete operational tasks were administered the formal operational tasks.

T-test results indicated the formal operational group scored moderately higher in mathematics achievement than the concrete operational group. Analysis of variance results indicated boys aged thirteen were slightly more often formal operational than all other groups except girls aged twelve. Twelve year old girls were slightly more often formal operational than twelve year old boys. No significant differences were found among chronological ages or sexes in mathematics achievement.

It was concluded individuals exhibiting formal operational thought score higher in mathematics achievement than those exhibiting concrete operational thought. Girls are more often formal operational thinkers than boys at age twelve, boys more by age thirteen. Finally, it was concluded there were no significant differences among ages or sexes in mathematics achievement for this selected group of emerging adolescents.

### AN EXPLORATORY STUDY OF THE RELATIONSHIP BETWEEN LEARNER CONTROL PATTERNS AND COURSE COMPLETION IN COMPUTER ASSISTED INSTRUCTION

Order No. DA8313773

SASSCER, MONICA FLYNN, ED.D. *Virginia Polytechnic Institute and State University*, 1982. 142pp.

The study was designed to discover how community college students used the available learner control features of the TICCIT computer assisted instruction system, and to determine whether those students who completed all the course requirements of two TICCIT delivered courses within an eleven week academic term used different strategies to work through the instructional materials than those students who did not complete the courses. One hundred and forty eight students who enrolled in a developmental level Algebra I course and freshman level English grammar course participated in the study. Sixty-seven students met the criteria for course completion: 81 were non-completers. A log tape record was kept of the keypresses made by the subjects as they progressed through the topics of the lesson selected for the study. The sequences of keypresses resulted in the classification of nine different strategy patterns which were analyzed by means of chi-square contingency tables.

The findings were that community college students made use of the learner control options presented to them by TICCIT to develop learning strategies. While "successful patterns" were identified in the statistical analyses, these were actually used by an equal proportion of completing and non-completing students and could not be considered as paths to success for future TICCIT students. No evidence was found that students used a pattern consistently throughout a lesson. There was significant evidence that pattern choice was influenced by the subject matter studied and, specifically, by the topic of the segment. Students in the English course used more patterns which included EXAMPLES, whereas the students in the math course favored the RULE/PRACTICE combination. With regard to timely completion, however, the RULE/PRACTICE pattern was a successful option for both math and English course completers. The use of PRACTICE without reference to RULES or EXAMPLES was detrimental to the timely completion of math coursework, but beneficial in the case of the English course.

### A PERSONALIZED SYSTEM OF INSTRUCTION VERSUS A CONVENTIONAL METHOD IN A MATHEMATICS COURSE FOR ELEMENTARY EDUCATION MAJORS

**Order No. DA8227717**

**Schielack, Vincent Paul, Jr., Ph.D.** *The University of Texas at Austin*, 1982. 144pp. Supervisor: E. Glenadine Gibb

The purpose of this investigation was to assess the relative merits of a modified version of Keller's Personalized System of Instruction (PSI) and a conventional lecture-discussion method with respect to achievement in mathematics, transfer of mathematical knowledge, level of mathematics anxiety, and attitude toward mathematics. Also investigated was the existence of an aptitude-treatment interaction (ATI) between general reasoning ability and treatment with respect to mathematics achievement.

The sample consisted of sixty-seven students enrolled in a mathematics course required of elementary education majors at The University of Texas at Austin. Prior to treatment, all subjects were administered a test of general reasoning ability--the Necessary Arithmetic Operations Test (NAO), the short form of the Mathematics Anxiety Rating Scale (MARS), a one-item mathematics attitude scale, and a question used to ascertain the number of years of secondary school mathematics instruction each subject had received. After pretesting, subjects were randomly assigned to PSI and lecture sections. The PSI treatment was modified in three respects: (1) unit tests were evaluated by the instructor rather than student proctors; (2) self-pacing was restricted by end-of-semester deadlines; and (3) no lectures were given.

At the end of the course, all students in both treatment groups were administered a fifty-item achievement test, a ten-item transfer test, the MARS, and the mathematics attitude scale. Thirty PSI and twenty-eight lecture students completed the course. Results of the four comparisons were analyzed using t-tests; the ATI hypothesis was tested using multiple linear regression techniques. PSI students performed significantly higher ($p < .001$) than lecture students on the final examination and had significantly more positive ($p < .05$) attitudes toward mathematics. No significant differences between treatment groups were found for levels of mathematics anxiety or for the transfer test. There was no significant interaction between treatment and general reasoning ability.

Based on the results, mathematics achievement can be expected to be higher and post-course attitudes toward mathematics more positive for PSI than for lecture treatments. No differences can be expected between treatments in end-of-course levels of mathematics anxiety or in analysis-level behaviors. NAO scores are not a sound basis for placement in a PSI or a lecture treatment.

### THE ACHIEVEMENT AND ADJUSTMENT OF CHILDREN FROM OPEN AND TRADITIONAL ELEMENTARY SCHOOLS IN GRADE SIX OF TRADITIONAL MIDDLE SCHOOLS

**Order No. DA8321275**

**Schmitt, Rita Therese, Ed.D.** *Temple University*, 1983. 201pp. Major Adviser: Dr. Barbara N. Pavan

Pupils from open education classrooms in open space elementary schools were compared on achievement and adjustment factors to pupils from traditional classroom elementary schools. The 106 pupils from two open schools and the 158 pupils from our traditional schools had completed five years in the same elementary school and attended grade six together in three traditional middle schools. T-tests showed no significant difference between the means of the mental ability scores nor of the level of the mother's education for the two groups.

When the students began their education in the two open schools, the philosophy was described as open education and their teachers had been trained in open education methods. The schools were assessed for degree of openness when these students were in grade five. Some of the open classrooms had begun to move toward more traditional practices. Teacher answers on the Evans Questionnaire on School Openness yielded a 133.2 mean score for open school teachers and a 120.6 for traditional school teachers. This was not a statistically significant difference. However, there was a significant difference between the means at a .05 level when the most traditional school was compared to the most open school.

When the impact of the co-variables, sex, level of the mother's education and mental ability, was statistically removed, ANCOVA showed a significant difference at the .002 level or better between open and traditional students on all variables except the mathematics gain score. Open students had the greater mean gain score on the Gates-MacGinitie Reading Test. Open students received higher teacher assigned marks in both reading and mathematics. Students from open schools had fewer behavior adjustment problems. Students from open schools participated in more extracurricular activities. Although students from traditional schools showed a greater mean gain score on the Stanford Achievement Test in Mathematics, there was no statistically significant difference.

Since students from open schools scored better in five of the six variables when the impact of sex, level of the mother's education and mental ability differences was accounted for, the researcher concluded that students from open classrooms performed better than students from traditional classrooms when they attended traditional middle school together.

### AN ASSESSMENT OF ELEMENTARY SCHOOL STUDENTS' DEVELOPMENT AND APPLICATION OF PROBABILITY CONCEPTS WHILE PLAYING AND DISCUSSING TWO STRATEGY GAMES ON A MICROCOMPUTER

**Order No. DA8321392**

**Schroeder, Thomas Leonard, Ph.D.** *Indiana University*, 1983. 190pp. Chairperson: Dr. John F. Le Blanc

To achieve the object of the games used in this study, a player should choose moves ("captures") so that the probability of recapture by the opponent is minimized. The questions of the study included whether students develop understanding of this application of probability concepts as a result of experience playing, whether they develop this understanding as a result of discussing the games with an adult, and whether transfer occurrs from one game version to another.

The methodology of a "teaching experiment in the experiencing mode" was adopted. Audiotaped interviews were conducted with children in grades four to six as they played the games. Quantitative data were collected by routines in the computer programs; qualitative data were collected from the children's verbal reports. Data analyses included measures of the children's use of four known strategies (conscious and consistent rules for choosing moves), measures of the congruence between their statements about their strategies and their actual play, qualitative assessment of their statements reflecting understanding and application of probability concepts, and estimates of the transfer of concepts and strategies from one game version to the other.

Some subjects had little difficulty applying probability concepts and explaining their strategies. Others recognized that some positions changed hands more than others, but did not seem able to relate this to probability. Most students had difficulty producing exhaustive lists of the ways positions could be recaptured, and they made some errors in implementing their strategies.

It was concluded that the games are suitable activities, that discussion of them is valuable, and that the study's methodology was appropriate and fruitful.

## PROOF-WRITING ACHIEVEMENT AND VAN HIELE LEVELS AMONG SECONDARY SCHOOL GEOMETRY STUDENTS

**Senk, Sharon Louise, Ph.D.** *The University of Chicago*, 1983.

This research gathers base-line data on proof-writing achievement from a national sample, addressing central questions: To what extent can American secondary school geometry students write proofs? To what extent are van Hiele level of thinking and achievement on standard non-proof content related to proof-writing achievement?

The sample consisted of 1520 students from 74 geometry classes in 11 schools in 5 states, representing a variety of ethnic and socioeconomic groups. All had studied proof-writing. In the fall of 1980 students were tested for van Hiele level of development (VHF) and knowledge of entering geometry facts (EG). The following spring they took the van Hiele test (VHS) again, a standardized achievement test (CAP), and one of three non-overlapping forms of a proof test. The proof tests (Cronbach's alpha, .85 to .88) were created by the investigator; the van Hiele Geometry Test and the Entering Geometry Student Test, by the Cognitive Development and Achievement in Secondary School Geometry Project at the University of Chicago. Each proof test contains two short answer items and four full proofs like those found in standard texts. Proof tests were graded by eight experienced teachers using a 0 to 4 scale. Each item was graded blindly and independently by two teachers. Inter-rater reliability exceeded .90.

The results indicated that 30% of the students in geometry courses teaching proof have virtually no competence in proof-writng at the end of the year, 40% have some proof-writing skills, and about 30% achieve a 75% mastery level in writing proofs. There are no consistent sex-related differences in proof-writing achievement.

In general, data from this study show general but not complete agreement with predictions based on the van Hiele model. However, future research needs to sort out the overlap between the van Hieles' levels of thinking and achievement on standard content.

## IMPLICIT INTUITIVE STATISTICAL DESCRIPTION: PERCEPTIONS THAT MAY IMPEDE OR FACILITATE STATISTICAL INSTRUCTION Order No. DA8308571

**Service, Jolayne Williams, Ed.D.** *North Carolina State University at Raleigh*, 1982. 187pp. Supervisors: Barbara M. Parramore, James L. Cole

Statistical properties to which people intuitively pay attention were inferred from experiments in which subjects made similarity judgments about collections.

Each collection comprised 10 goldfish, identical except for their sizes. Five distinct sizes were used. The distribution of sizes varied from collection to collection.

In one experiment, children and adults sorted drawings of goldfish tanks, then pictorial histograms. Most subjects produced sorts that were independent of the positions of the fish in the stimuli. Nearly all subjects produced sorts apparently based wholly or partly on some measure of location (overall bigness or smallness) of the fish sizes in a stimulus; an appreciable minority produced sorts apparently based wholly or partly on some measure of dispersion of sizes. The mathematical sorting criterion that subjects most often expressed was the number of largest-size fish.

In another experiment, second-grade children, fifth-grade children, and adults judged tank stimuli, then histogram stimuli, in triads tests. The children and some adults saw stimuli like those of the first experiment. For other adults, the goldfish in each tank stimulus were arranged from smallest to largest. For the remaining adults, tank and histogram stimuli displayed numerals instead of goldfish.

Nonmetric multidimensional scaling of the size distributions was performed; the INDSCAL procedure of Carroll and Chang was used to analyze differences among the groups of responses marked by different combinations of age and stimulus representation. Two dimensions were identified: a location dimension, well described by a weighted sum of the numbers of largest- and second-largest-size fish in a stimulus, and a dispersion dimension, well described by the coefficient of variation. Dimension weights were more variable among groups of responses to tank stimuli than among groups of responses to histogram stimuli, with second-grade children's responses to tank stimuli most heavily weighted on the location dimension.

A separate analysis of differences among subjects suggested that (a) many subjects could be classified as attentive primarily to location or primarily to dispersion and (b) children were most diverse in their patterns of response to histograms.

Implications of these judgments for statistical instruction are discussed.

## ADAPTING THE DEVELOPMENTAL INSTRUCTION MODEL, BASED ON PERRY'S THEORY, TO A MATHEMATICS CONTENT COURSE FOR PRESERVICE ELEMENTARY TEACHERS TO ENHANCE ATTITUDES TOWARD MATHEMATICS, COGNITIVE DEVELOPMENT, AND ACHIEVEMENT Order No. DA8323585

**Shearn, Elizabeth Louise, Ph.D.** *University of Maryland*, 1982. 219pp. Supervisor: Dr. Neil Davidson

This study investigated whether Perry's theory of cognitive development, applied to a mathematics content course for preservice elementary teachers, would enhance levels of attitude, cognitive development, and achievement. Two sections of this course at the University of Maryland were randomly chosen with a total of 43 college students divided between two sections. The Developmental Instruction Model, a process model of instructional design that varies the variables of challenge and support, provided the basis of implementations that were made within the text and applied to one section of the course designated as the experimental group. The other section, the control group, was taught with no deviation from the text.

The Mathematics Attitude Inventory measured self-concept in mathematics, math anxiety, and enjoyment in mathematics. Measurement of Intellectual Development, an instrument which defines positions on the Perry Scheme, measured cognitive development in reference to general knowledge. Achievement was measured by final examination. Ability, measured by SAT-Math scores, was used as a covariate.

Limitations included: use of nontraditional text, small sample size, and lack of randomization. Similar methodology was used in both groups.

A repeated measures design was used for the pre-post instruments and analysis of covariance was applied to the achievement measure. Significance was set at a confidence level of $p < .05$.

No significant differences were found between experimental and control groups for any factors. Combining these two groups, significant differences were found between the pre and post measurements of self-concept and cognitive development. These two factors significantly improved in a course consistent with developmental instruction theory.

Further study is needed to investigate if (1) the cognitive development of students differs in a traditionally taught mathematics class as opposed to one taught developmentally; (2) preservice elementary teachers, advanced to multiplistic thinking in a mathematics class, would foster this thinking in their own students; and (3) there are specific characteristics in the learning of mathematics that could be applied in developing an instrument to measure Perry positions on the Perry Scheme in reference to mathematics.

### THE RELATIONSHIP BETWEEN FAMILY STRUCTURE AND ACADEMIC ACHIEVEMENT IN SELECTED VARIABLES OF THE EDUCATIONAL QUALITY ASSESSMENT

**Order No. DA8305699**

SHILLING, HARRY FREDERICK, D.ED. *The Pennsylvania State University*, 1982. 166pp. Adviser: Dr. Patrick D. Lynch

The main purpose was to investigate the influence of family structure on academic achievement when socioeconomic status, race, sex, residence, and parental interest were controlled. The study was based on 39,000 eighth-grade students' reading, mathematics, and composite achievement scores obtained from the 1981 administration of the Educational Quality Assessment, a division of the Pennsylvania Department of Education.

Data analyses were conducted on the entire sample and white, black, and single-parent only subsamples. Simple comparisons of single- and two-parent children complemented the multiple regression analyses. Significance criterion was the .01 level.

In the uncontrolled analyses, the findings were: (1) Single-parent children achieved at significantly lower levels than two-parent children in reading, mathematics, and composite achievement with the exception of black children in reading. (2) Controlled analyses consistently found that family structure explained less than 1 percent of the variance in all regression models and was a poor singular predictor. (3) Socioeconomic status was the best predictor of achievement of two-parent children and race was the best predictor of the achievement of single-parent children. Black children consistently achieved at significantly lower levels than white children and males achieved at significantly lower levels than females in reading achievement only. (4) Uncontrolled and controlled analyses revealed that there were no significant differences in achievement related to the type of parent absence (deceased or voluntary) among the subsample of single-parent children. (5) The controlled analysis of single-parent children indicated that children living with their mother achieved at significantly higher levels than those living with their fathers. The sex of the custodial parent was a significant predictor of achievement when the effects of socioeconomic status, race, sex, residence, and student perception of parent interest were held constant.

### A COMPARISON OF PROGRAMMED INSTRUCTION VERSUS LECTURE-DEMONSTRATION AS A METHOD FOR TEACHING DIGITAL COMPUTER ARITHMETIC AT THE POST-SECONDARY SCHOOL LEVEL

**Order No. DA8306819**

SHINE, SAM SUNSHOWN, PH.D. *Texas A&M University*, 1982. 63pp. Chairman: Dr. James L. Boone, Jr.

The purposes of this study were to determine the effectiveness of programmed instruction on the teaching of digital computer arithmetic to the post-secondary electronic technology students and to compare the results with the lecture-demonstration method. This study also attempted to determine if students' previous knowledge of digital computer arithmetic influenced the posttest scores.

The study was conducted at the Institute of Electronic Science, a division of the Texas Engineering Extension Service at College Station, Texas. Data compiled from a sample of 41 students were used for statistical comparisons. There were 21 students in the experimental group who received the programmed instruction and there were 20 students in the control group who received the conventional lecture-demonstration instruction.

A pretest was administered at the beginning of the experimental study. A posttest was given to both groups of students after the treatments had been applied.

The Split-Half method and the Spearman-Brown Prophecy formula were utilized to calculate the reliability coefficients of the pretest and the posttest. The calculated reliability coefficients of the pretest and the posttest were .865 and .945 respectively, an indication that both pretest and posttest appeared to be measuring the same phenomena.

The statistical design of the experiment utilized the Pretest-Posttest Two-Group Simple Randomized Design. The analysis of covariance was used to analyze the data statistically. The .05, non-directional, statistical significance level was used to test the hypotheses.

The conclusions formulated from the analysis of data collected through this research indicated that: (1) Programmed instruction was as effective as a conventional lecture-demonstration method in teaching students digital computer arithmetic. (2) The posttest scores of experimental and control groups have no linear relationship with that of the pretest scores. (3) Both the programmed instruction and the lecture-demonstration methods were effective in promoting students' achievements in the learning of digital computer arithmetic.

### INDIVIDUAL DIFFERENCES IN SECOND GRADERS' MATHEMATICAL PROBLEM SOLVING

**Order No. DA8307216**

SHIPSTEAD, SUSAN GAEDE, PH.D. *Stanford University*, 1983. 331pp.

The nature of mathematical ability and young children's problem solving processes were investigated. Scores on achievement tests, the Raven's Progressive Matrices, classroom math tests, and teacher ratings were collected for 82 second graders to provide estimates of their crystallized and fluid abilities. Sets of math tasks, constructed to make differential demands on crystallized and fluid abilities, were administered individually. The errors children made on the math tasks were analyzed; comparisons between problem categories showed that some were significantly more difficult than others. Sources of difficulty were the operation involved, the quantity of numbers to process, and blanks and their placement. The use of counting aids (e.g., fingers) did not affect the correctness of responses with two exceptions: this solution strategy was useful for some problems but not for others. The average time spent on incorrect items was significantly longer than the average time spent on correct items for each math task. Children who worked the simplest task quickly and correctly earned higher scores on the more difficult tasks than those who worked them slowly and correctly. Interview results indicated wide individual differences in solution strategies despite a common math curriculum. For some of the statistical analyses, the subjects were divided into two groups, depending on when they took the achievement tests. The intercorrelations of variables for groups suggested a stronger association between the Raven and achievement tests in the first grade than in the second grade and for the genders within groups a stronger relation between the Raven and achievement tests for girls than boys. Through regression analyses, the independent variables successfully explained large amounts of variance in the math task scores but did not differentially predict them as hypothesized. A cluster analysis program was used to explore possible structures in relations among the items not associated with a priori task categories. Some clusters obtained appeared to reflect problem categories and levels of difficulty. This study specified some components of math problems that make them difficult for second graders. Individual differences in problem solving processes were persistent and wide-ranging. Questions were raised about the abilities necessary to do well on achievement tests in first versus second grade and about the assumed freedom of Raven's scores from school and other environmental factors, at least in young school-age children. Further research is needed to validate the constructs of fluid and crystallized abilities in early elementary children and to distinguish them on practical measures.

### APPLICATION OF A COMPOSITION TECHNIQUE TO CORRECT CHOICE OF OPERATIONS IN MATHEMATICAL WORD PROBLEMS

**Order No. DA8305002**

SHOEMAKER, BEVERLEY MONTANDON, ED.D. *Auburn University*, 1982. 150pp. Director: Dr. A. K. Cadenhead

The primary purpose of this study was to examine the role composition might play in the selection of correct operations for the solution of mathematical word problems. It was also the purpose of the study to examine the abilities and processes of eighth-grade students in the solution of such problems. In addition, the importance of the selection of inappropriate operations to the total number of errors in such problems was investigated in this study.

An instrument was developed by the researcher, two forms of which were field tested for equivalency prior to the experiment. Each form of the instrument consisted of 10 multi-step mathematical word problems and had two response modes, computational and compositional. Both response modes were administered to each subject in the study.

The population consisted of 339 eighth-grade students in a suburban junior high school in middle Georgia. These subjects represented the total population of the eighth grade of this particular junior high school and; therefore, represented all levels of mathematical competence present in the school.

A summary of the findings included the following: (1) Students performed at an unacceptable level (below 70%) on multi-step problems. (2) More than 80% of the errors in the computational response mode were attributable to a selection of inappropriate operations. (3) Response to mathematical word problems through the writing of a paragraph explaining the process for solution resulted in significantly fewer errors in selection of appropriate operations for solution. (4) The paragraphs written by subjects in this study did not illustrate a heuristic for problem-solving that was generalized either to the item presented or to the writer. (5) Response to mathematical word problems through the writing of a paragraph explaining the process for solution resulted in a significant number of changes to correct selection of operation.

## EFFECTS OF VARIED MEDIATION ON SPATIAL CONCEPTS IN YOUNG CHILDREN Order No. DA8311704

**Sichel, Arthur Gutman**, Ph.D. *Yeshiva University*, 1982. 115pp.

Piaget and Inhelder begin presentation of their thesis that a child's conception of space is invariably topological before it is projective or Euclidean with a tactile-kinesthetic to visual shape recognition task, with some shapes designated topological and others Euclidean. Fisher found that when he taught nonsense syllable names for the shapes, there was greater success with the Euclidean than topological shapes. He suggested a linear rather than topological primacy in that circumstance. The validity of grouping the shapes as topological vs. Euclidean was questioned but it was noted that a curvilinear vs. rectilinear categorization would be valid. It was asserted that Fisher's work implies a reversal of order of concept acquisition with nonsense syllable name learning as mediation.

The study was replicated with seven mediating conditions: (1) nonsense syllable name learning, (2) prior visual exposure to the shapes, (3) no prior exposure, (4) learning culturally designated names for the shapes, (5) rehearsal of names the child assigns to the shapes, (6) playing a simple game with the shapes, and (7) playing the same game, but without handling the shapes. Under all conditions, scores for the 96 white, middleclass children ages from 3-1 to 5-8 years, were higher for curvilinear than rectilinear shapes. Reasons for the failure to replicate Fisher were discussed, suggesting that these results are more reliable.

Analysis of variance showed mediation to be a significant factor. The analysis supported grouping experimental conditions into three categories: (1) mediations using signifiers of internal origin, (2) mediations using signifiers of external origin, and (3) conditions which did not guide the use of mediation. Category (2) scores were higher; category (3) scores were interspersed among the others, indicating without guidance children mediate choosing signifiers of either internal or external origin. It was argued that categories (1) and (2) correspond to primary and secondary process thinking, and that this demonstrated primary process thinking may be involved in such cognitive functioning. Piaget did not consider primary process thinking in his analyses and theoretical considerations. This omission was discussed along with possibilities suggested by its conclusion in cognitive theory.

## A STUDY OF ALTERNATIVE MODELS FOR PREDICTING MATHEMATICS PERFORMANCE Order No. DA8308348

**Siegel, Ross Garris**, Ph.D. *The University of North Carolina at Chapel Hill*, 1982. 170pp. Supervisor: John P. Galassi

Most recent literature on mathematics performance has cited sex-related differences in math ability, sex-role socialization, and math anxiety as critical variables. This study explored a new conceptual approach, based on Bandura's social learning theory, to account for differential mathematics performance. Subjects were 143 university students in an introductory math course. Four models were tested for predictive power in regression equations, with final exam score as the criterion in each instance.

Model 1, based on social learning theory, included the following variables, in this order: (a) skills (average previous course grade); (b) incentives; (c) self-efficacy or self-judged ability; and (d) outcome expectations. Skills accounted for 49% of variation in the criterion and each additional variable added significantly to prediction. The full model accounted for a significant amount (57%) of variance in exam score.

Model 2 was based on the following variables hypothesized to affect math performance: (a) SAT-Q, or general math ability; (b) math anxiety; (c) sex; and (d) sex-role orientation. Only SAT-Q was a significant predictor of performance. The full model accounted for a significant amount (18%) of variation in performance. In two separate random divisions of the sample, Model 1, based on social learning theory, proved to be a significantly better predictor of final exam score than Model 2, based on variables of interest in current mathematics literature.

The study also addressed the question of specificity of assessment. Each variable listed above, except sex, was measured in two ways. As Bandura advocates, Model 3 employed situation-specific measures of all study variables, relating them to the math exam and attitudes about it. Model 4, with a more traditional "trait" approach, employed measures of study variables which assessed subjects' general attitudes about mathematics and performance. Both models accounted for a significant amount of variance in final exam score, but Model 3 was a significantly better predictor (56% vs. 22%).

Although the skills component was clearly the most critical factor in final exam performance, these findings support the predictive utility of social learning theory for behaviors requiring higher cognitive skills, as well as for the phobic behaviors to which it is more commonly applied.

## THE DEVELOPMENT AND EVALUATION OF A METHOD FOR TEACHING BASIC MULTIPLICATION COMBINATIONS, ARRAY TRANSLATION, AND OPERATION IDENTIFICATION WITH THIRD GRADE STUDENTS Order No. DA8322597

**Sigda, Edward Joseph**, Ed.D. *Temple University*, 1983. 16[illegible]pp. Major Adviser: Dr. Eugene C. Abraham

*Purpose*. The primary purpose of this investigation was to determine what significant effects, if any, does a treatment which presents instructional experiences in the concrete, pictorial, and symbolic modes have upon third grade students' acquisition and retention of introductory multiplication skills. Nine null hypotheses were tested to determine if differences existed in the treatment groups' acquisition and/or retention of: (1) the basic multiplication combinations, (2) skills in array translation, and (3) skills in operation identification.

*Procedures*. This investigation was conducted in the third grade of the Sharon Hill Elementary School, Sharon Hill, Pennsylvania. Two teachers and fifty-two students were randomly selected to form one control and one experimental group. The teacher of the control group followed the lesson plans as outlined in the teacher's edition of *Macmillan Mathematics Book 3*, Thoburn et al., Macmillan Publishing Company, 1978. The teacher of the experimental group used a sequential-modal approach which included activities with manipulatives, pictorials, and symbolic representations. The subjects were taught introductory multiplication content over a period of thirty-eight days.

T-test analysis was used to determine the significance of the differences of the group mean scores in the acquisition and retention of introductory multiplication skills. Analysis of variance was used to determine if significant interactions existed between teaching methods and IQ and teaching methods and sex of students.

*Conclusions*. Within the limitations of this investigation, the data appear to support the following conclusions: (1) The use of the sequential-modal approach results in a significantly higher level of acquisition of the basic multiplication combinations, array translation skills, and skils in operation identification over the use of ikonic plus symbolic modes of representation. (2) The use of the sequential-modal approach results in a significantly higher level of retention of the basic multiplication combinations and array translation skills over the use of ikonic plus symbolic modes of representation. (3) Insofar as the sequential-modal approach provided for an understanding of the multiplication process, the findings tend to support the assumption that teaching for understanding can produce superior results.

### AN ANALYSIS OF PRACTICES IN TEACHING READING IN THE CONTENT AREAS AT COMMUNITY AND JUNIOR COLLEGES IN ALABAMA Order No. DA8317207

**Simon, Mary Drago**, Ed.D. *Auburn University*, 1983. 109pp. Director: John S. Martin

The purpose of this study was to identify and to analyze reading-related strategies used for the teaching of reading to junior college students. An instrument, the "Post-Secondary Reading Practice Survey," was developed and used to determine if differences existed in the way junior college instructors perceived the importance of listed strategies, and the degree to which they implemented the strategies when compared by subject area and whether or not they had had a course in the teaching of reading.

The survey was composed of 31 items subdivided into six sections and was administered to instructors teaching in the subject areas of social studies, language arts, business, mathematics and science, fine arts, physical and health education, and nursing and medical technology in junior colleges in Alabama in the Winter of 1983.

A multivariate analysis of variance (MANOVA) was used to determine if significant differences existed in importance instructors placed on strategies and their frequency of implementation among subject areas and if a significant difference existed when instructors had formal instruction in the teaching of reading. Where significant differences occurred among subject areas, a univariate analysis of variance, Duncan's Multiple Range Line Test, was used to determine in which strategies the differences lay.

Results of the analysis indicated that a significant difference existed in importance rankings among subject areas in at least two items in the sections of Vocabulary, Referencing, Study Skills, and Comprehension. A significant difference existed in teacher training in the section of Vocabulary only. With regard to the implementation ranking of reading strategies, a significant difference existed among subject areas in the same two items in the sections of Vocabulary, Referencing, Study Skills, and Comprehension. There was no significant difference with respect to teacher training.

Significant interaction effects did not exist between importance ranking and implementation ranking of reading strategies.

Based on the review of literature, consultation with reading specialists, and collection and analysis of data, the Post-Secondary Reading Practice Survey was determined to be valid and clearly interpretable.

### TEACHERS' PREDICTIONS OF STUDENTS' PERFORMANCE ON MICHIGAN EDUCATIONAL ASSESSMENT PROGRAM MATHEMATICS TESTS Order No. DA8227818

**Simon, Rona Friedlander**, Ph.D. *The University of Toledo*, 1982. 155pp.

The purpose of this study was to investigate the accuracy of teachers' predictions of students' performance on the Michigan Educational Assessment Program (MEAP) mandated minimal competency tests for 4th–, 7th–, and 10th–grade mathematics. In late spring, 3rd–, 6th–, and 9th–grade teachers in a small rural school district in southern Michigan indicated on an instrument designed for this study their predictions of their 195 students' performance on the criterion-referenced tests to be given the following fall. A sample from a second small school district was utilized to cross-validate the results for the population in the study. The variables (sex, grade, majority-minority status, number of paper-and-pencil tests per nine-week period, performance on the MEAP mathematics test, predicted performance on the MEAP mathematics test, report card mathematics marks) were studied as to (a) their relationships with teachers' prediction accuracy and (b) their potential usefulness in predicting teachers' prediction accuracy. Statistical methods used were correlation and multiple regression techniques. Calculations of percentages were used to determine for which of 28 objectives on the MEAP mathematics tests (a) students's successful performance was accurately predicted, (b) students' unsuccessful performance was accurately predicted, (c) students' performance was overestimated, and (d) students' performance was underestimated. For each of the four categories, specific objectives were identified and reported. Based on the analysis of objectives, the following conclusions, indicating that teachers were good predictors, were formulated: (1) On the average, teachers' predictions of pupils' performance by objectives were accurate. (2) Students for whom teachers predicted successful performance on an objective tended to perform successfully on the objective. From the findings in the study, it was shown that errors in teachers' predictions of pupils' performance by objective tended to be underestimation rather than overestimation.

### CONCEPTUAL DEVELOPMENT OF THE PART-WHOLE AND OPERATOR SUB-CONSTRUCTS OF RATIONAL NUMBERS Order No. DA8324389

**Sinicrope, Rose**, Ed.D. *Virginia Polytechnic Institute and State University*, 1983. 104pp.

The hypothesis that the conceptualization of the part-whole and operator interpretations of fraction differ from the other interpretations and are developmental was tested using an adaptation of Gerald Noelting's research design for testing proportional reasoning ability.

One hundred thirty-two southwestern Virginian students in math classes of average ability, grades five through nine, completed the randomly administered part-whole and operator instruments and Noelting's ratio instrument.

An ANOVA, $\alpha = 0.05$, resulted in supporting the hypothesis of differences in the order in which mature conceptualization is attained for the three sub-constructs. Scheffe tests, $\alpha = 0.05$, yielded an ordering of part-whole, operator, and ratio for this attainment.

Chi-square analyses and the use of phi coefficients provided some support for a dependency relationship of operator on part-whole.

Coefficients of reproducibility were computed as 0.95 for part-whole, 0.91 for the operator, and 0.92 for the ratio instruments. However, coefficients of scalability were below the criterion of 0.70 for all but the ratio instrument. The ordering, according to difficulty of the items, varied by interpretation.

A combination of factor analysis on the items, Kolgomorov-Smirnov analysis of the distributions of students successful at two adjacent points on the scalogram, and an examination of strategies used provided some preliminary description of the conceptualization process for rational numbers.

### EFFECTS OF INSTRUCTIONAL ENVIRONMENT AND SOCIOECONOMIC STATUS ON ACHIEVEMENT LEVELS FOR GIFTED STUDENTS Order No. DA8313693

**Slater, Judith June**, Ed.D. *The University of Florida*, 1082. 162pp. Chairman: Dr. Paul S. George

Students identified as gifted are instructed in an enrichment resource class for a maximum of twelve hours per week. The instructional environment of this enrichment class differs from that of the base class. Effectiveness of a particular environment on achievement for these students depends on adaptability to the amount of structuring in the base class and enrichment class, and upon student background characteristics of socioeconomic status.

This study investigated the effect of varying instructional environments on achievement levels for fifty-four fifth grade gifted students from varying socioeconomic statuses. Three observers were trained to utilize the methodology section of COKER to observe each subject in base class and enrichment class. A composite score for structuring of each environment was determined. Data were analyzed by stepwise multiple regression for each of ten areas of achievement on the California Achievement Test for the 1982 school year with 1981 achievement, base class environment, enrichment class environment, socioeconomic status and length of time in enrichment program.

Results indicate that base classes are relatively structured environments which, together with socioeconomic status, influence achievement areas requiring rote recall and recognition of factual knowledge (Language Mechanics, Language Expression). Enrichment classes are relatively unstructured and prolonged exposure to this environment, determined by length of time in enrichment class, significantly affects achievement areas which require higher levels of thinking (Reading Vocabulary, Math Application). Success, in terms of achievement, appears to be dependent upon the ability to function and adapt to these two learning environments. Students who have this ability are succeeding in both abstract and concrete achievement areas.

Recommendations for gifted students based on this study are that they be identified early in their school career in order to have prolonged exposure to enrichment classes. The teaching methodology and curriculum should be largely student-centered so as to maximize contact with an unstructured environment.

## THE EFFECT OF COOPERATIVE AND COMPETITIVE GAMES WITH LEARNING DISABLED ADOLESCENTS ON ARITHMETIC PERFORMANCE AND ON-TASK BEHAVIOR

Order No. DA8313694

SMALLEY, SHELIA YVETTE, PH.D. *The University of Florida*, 1982. 149pp. Chairman: Cecil D. Mercer

The purpose of this study was to investigate the effects of cooperative games, competitive games, and worksheets on the arithmetic performance and on-task behavior of learning disabled (LD) adolescents. Also, the relationship between arithmetic performance and time on-task was examined across the three treatments.

From the sample of 36 students, 12 were assigned to each of the three treatment conditions: cooperative, competitive, and worksheets (control group).

The basic design of the study was a posttest, with covariant on the pretest scores. The arithmetic performance scores were analyzed with analysis of covariance (ANCOVA) and the Bonferroni post hoc procedure. The on-task scores were analyzed with ANCOVA and the Johnson-Neyman technique. The correlation between arithmetic scores and on-task behavior was analyzed using the Pearson product-moment. All statistical procedures were tested at the .05 level of significance.

Results of the data analysis indicate that worksheets were significantly better than cooperative. Competitive was not significantly different from worksheets, which suggests that they are equally effective. Although competitive was not significantly different than cooperative at .05, they were different at .0549. There is a potential trend that competitive is better than cooperative. Also, there was a significant difference in time on-task between the cooperative and competitive groups, favoring competitive for higher ability students and cooperative for lower ability students. And, there was a significant difference in time on-task between the cooperative and worksheet group, favoring worksheets for higher ability students, and cooperative for lower ability students. The on-task comparisons between the groups must be cautiously interpreted because much of the data had to be extrapolated. There was no significant relationship between arithmetic performance and on-task behavior for the overall group; however, it was significant for the worksheet group ($r = .68$, $p \leq .05$).

The results suggest there are variations in performance and time on-task in various learning activities. Thus, in planning for the instructional needs of LD adolescents, this study suggests that worksheets seem to work better overall for arithmetic performance. For on-task behavior, there appears to be an interaction between activity and ability level of the student.

## BILINGUAL EDUCATION: AN ASSESSMENT OF ITS EFFECT ON ACADEMIC ACHIEVEMENT AND SELF-CONCEPTS

SMEDLEY, LINDA KAY, ED.D. *University of Southern California*, 1983. Chairman: Professor Robert Baker

*Problem*. In order for language minority students to have an equal opportunity to succeed in school and in the American mainstream culture, they must receive special assistance within the school. Although the federal government and the courts have mandated special language services, neither has specified in what form this assistance should occur.

This study compared two forms of language assistance. It attempted to determine whether academic achievement and affective development are significantly greater for non-English proficient students taught bilingually than for non-English proficient students monolingually.

*Methodology*. The sample for this study consisted of 37 Spanish-speaking students enrolled in English as a Second Language classes from two high schools.

Factor analysis reduced 16 variables to 4 outcome factors and 2 covariate factors. An analysis of covariance was performed on the following outcome variables using socioeconomic status and absenteeism as covariates: self-concept, English language skills, reading skills, and mathematical skills.

*Findings*. Analysis of covariance yielded no significant differences between the programs regarding the four outcome variables. The $F$ ratio for the following outcome variables were $< 1$: self-concept, language skills, readings skills, and mathematical skills. A significance was observed for self-concept and reading skills with the socioeconomic status covariate.

*Conclusions*. The bilingual and monolingual programs had similar effects on student self-concepts, language skills, reading skills, and mathematical proficiency. Some variation in both the self-concept and the reading skills variables existed because of the socioeconomic status covariate.

*Recommendations*. (1) Proficiency in the primary language should be included as a variable. (2) Quantity and quality of Spanish spoken by bilingual teachers and methods of instruction should be examined. (3) The interrelatedness of socioeconomic status with reading skills and self-concepts should be considered.

## ON THE DECISION TO ENROLL IN OPTIONAL HIGH SCHOOL MATHEMATICS COURSES

Order No. DA8321077

SMITH, GREGORY PAUL, PH.D. *University of Denver*, 1983. 160pp.

This study examined the relationships among a selected set of self-related cognitions and affects and the decision to elect to participate in a first optional high school mathematics course. An additive expectancy/value model of behavior was postulated to account for mathematics participation. This model specified that only expectancy (probability of success) and value (perceived utility of mathematics and liking for mathematics) directly "cause" mathematics participation. All constructs were derived from a self-report measure administered to students shortly after they had made a decision to pre-enroll (or not) in a first optional high school mathematics course.

The subjects in the study were 644 ninth and tenth grade students from six high schools. The sample was 51.2 percent female and 48.8 percent male. Students appeared to be relatively average in terms of socioeconomic indicators.

Based on initial data analyses and a review of the existing literature, an initial structural model was fit to the data for the sample as a whole. With slight modifications, this model fit the data reasonably well for both sexes in both weighted and unweighted maximum likelihood structural analyses. There was some support for an expectancy/value model of mathematics participation with two major exceptions. First, future aspirations (e.g., career and educational aspirations) seemed to have a strong direct causal effect on mathematics participation, while expectancy had little direct effect on mathematics participation. It appears as though the latter result may have occurred because of the very specific definition afforded "expectancy" in this study; namely, probability of success in one's next mathematics course/confidence in one's ability to learn mathematics. It is suggested that future research specify expectancy of success in relation to mathematics participation in terms of more long-range objectives--for example, the probability that additional mathematics participation might help one achieve future educational goals.

Finally, results indicated that, for females, affective components of attitudes toward mathematics (i.e., liking for mathematics) may have a stronger direct causal effect on mathematics participation than do belief components of attitudes toward mathematics (i.e., perceived utility of mathematics for one's future). Results also indicated that these findings may be reversed for males, with beliefs about mathematics having a stronger direct effect on mathematics participation than affect toward mathematics.

### THE RELATIONSHIP OF SELECTED VARIABLES TO PERSISTENCE AND ACHIEVEMENT IN A COMMUNITY JUNIOR COLLEGE

Order No. DA8312483

SMITH, NANCY BLAIR, Ed.D. *Auburn University*, 1983. 106pp. Director: Mark E. Meadows

The two purposes of this investigation were to determine whether there were significant differences between freshman persisters and nonpersisters and to determine what variables would predict freshman grade-point average. The variables were drawn from four areas: (1) use of college student services, (2) participation in the cultural and social events of the college, (3) academic adjustment, and (4) selected demographic measures.

The population for this study consisted of all persons who entered Enterprise State Junior College Fall quarter of 1981 with seven hours or fewer of college credit. These persons were followed during their freshman year. When withdrawal occurred, students were asked to complete the Withdrawal Follow-up Questionnaire. At the end of Spring quarter, all persisting students were asked to complete a Student Follow-up Questionnaire. Responses were received from 488 freshmen for an overall response rate of 97.6 percent. Other data necessary for the study were obtained from official college records and the Dean of Students' Office.

Discriminant analysis was used to weigh and linearly combine significant predictor variables so that persisters and nonpersisters were as statistically distinct as possible. Eleven predictor variables were found to be significant at the .05 level. These were sex, age, marital status, educational background, number of hours completed Fall quarter, entering college goal, use of testing services, high school visit to Career Development Center, desire for career information, desire for decision-making skills and the number of changes student makes in his schedule. By using the derived formula, 73.5 percent of the nonpersisting students were correctly classified.

Multiple regression analysis was used to determine which predictor variables most significantly predicted grade-point average. The seven best predictors in order of entrance into the regression equation were high school grade-point average, hours completed Fall quarter, age, mathematics placement score, time chosen to take classes, English placement score, and marital status. The multiple correlation computed for the significant group of variables was 0.715, this accounted for 51 percent of the variance of the criterion variable.

### THE EFFECTS OF A SELF-PACED COLLEGE ALGEBRA PROGRAM ON MATHEMATICS ACHIEVEMENT AND MATHEMATICS ANXIETY

Order No. DA8311567

SMITH, THOMAS H., Ed.D. *Temple University*, 1983. 198pp. Major Adviser: Professor Jesse Rudnick

*Statement of the Problem*. This study was conducted to answer the following question. Do students who study College Algebra using a self-paced approach obtain higher mathematics achievement scores and lower mathematics anxiety scores than students who study College Algebra using a traditional approach?

*Procedure*. The scope of the study was limited to 70 students who completed the Math 120 Collge Algebra course at Bucks County Community College, Newtown, PA. These students were enrolled in a traditional or self-paced approach. The four sections in the study were intact and self-selected by the students. Two mathematics instructors were involved in the study.

The data analyzed in this study were derived from scores on the Fennema-Sherman Mathematics Anxiety Scale, a mathematics pre-test and a post-test that measured the achievement of the objectives of College Algebra, and a questionnaire sent to the self-paced drop-outs.

*Findings*. As a result of statistically testing the hypotheses at the .05 level of confidence, the following findings were established: (1) There is no significant difference in the main effects of the mathematics achievement scores of students in the self-paced sections and the traditional sections. (2) Students who possessed the most knowledge of College Algebra upon entering the course achieved higher achievement scores in the self-paced approach than in the traditional, while the students who possessed the least knowledge of College Algebra upon entering the course received higher post-test scores in the traditional groups. Regions of significance were established to determine where between-group differences in achievement did occur. (3) There is no significant difference in the main effects of the anxiety post-test inventory scores of students in the self-paced and the traditional modes of instruction. (4) There is a significant difference in the mathematics anxiety post-test inventory scores for the traditional males when compared to the mathematics anxiety post-test inventory scores of the self-paced males. (5) The high mortality rate experienced in the self-paced sections was simply peculiar to this sample and did not effect the overall results of this study.

*Conclusions*. The results of this study show that students who studied College Algebra with a self-paced approach did not differ significantly in performance nor in mathematics anxiety than students in the traditional mode of instruction. One can conclude that the self-paced mode of instruction is at least comparable to the traditional approach and thus can be considered as a viable alternative to learning mathematics.

### HOLLAND PERSONALITY TYPES, STUDENT ATTITUDES, AND OTHER FACTORS WHICH AFFECT THE PREFERENCES OF PRESERVICE ELEMENTARY TEACHERS IN A MATHEMATICS CONTENT COURSE

Order No. DA8308773

SONNABEND, THOMAS ANDREW, Ph.D. *University of Maryland*, 1982. 230pp. Supervisor: Dr. Neil A. Davidson

This study explored how well four mathematical attitudes and the Holland personality types of preservice elementary teachers explained their mathematical preferences. The four attitudes studied were interest level, perceived usefulness, confidence/anxiety level, and perceived difficulty. General mathematical preferences were assessed as well as specific preferences concerning content, method of study, teacher style, and course materials. The researcher also sought other factors which helped explain students' mathematical preferences.

The study involved five sections of Math 211 (geometry, computing, and statistics) for preservice elementary teachers at the University of Maryland. Preservice elementary teachers are predominantly Holland type S (social) which suggested they would prefer studying social applications of mathematics and learning through cooperative group work. The researcher examined overall lesson ratings and four student attitudes toward six lessons which matched type S, C (conventional), and I (investigative) to varying degrees. Students responded to objective and open-ended questions after each lesson.

Students were also given six options for a computer assignment where each option was matched to a different Holland type. Students completed a course evaluation form expressing general mathematical preferences and mathematical preferences specifically matched to Holland types.

Holland type theory was moderately effective in predicting students' mathematical preferences. Students enjoyed type S content, but also liked a metric lesson (type C) which was related to teaching. The perceived usefulness of the content predicted student preferences better than Holland type theory. Student/environment congruence of Holland types helped explain student preferences concerning method of study. However, students were also concerned about having more structure when studying new topics. Using Holland type theory in conjunction with a cognitive stage model might better explain students' method preferences.

The study of student attitudes indicated factors which were related to student lesson preferences. Students preferred lessons which they found interesting and useful while also preferring lessons which were informative, understandable, and novel.

The five factors which appeared to best explain students' mathematical preferences were usefulness, informativeness, novelty, interest level, and clarity. While interest level is harder to control in teaching or research, the other four factors indicate specific ways to improve teaching and offer feasible variables for further research.

### A LABORATORY ACTIVITIES TEXTBOOK VERSUS TRADITIONAL GENERAL MATHEMATICS TEXTBOOKS FOR TEACHING COMPUTATIONAL SKILLS TO TENTH GRADE LOW ACHIEVERS Order No. DA8309080

Speck, Royce Allen, Ed.D. *University of Kentucky*, 1982. 152pp. Director: Dr. Ronald K. Atwood

This study was designed to test the effectiveness of *Geometry without Proofs*, as compared with traditional general mathematics textbooks in teaching tenth grade low achievers computational skills.

Matched pairs of classes were selected in eight high schools. One class of each pair used *Geometry without Proofs*, while the other used a traditional general mathematics textbook.

The independent variables in this study were *Geometry without Proofs* and several traditional general mathematics textbooks. The dependent variables were the students' scores on the computation section of the *Comprehensive Test of Basic Skills* (*CTBS*), the *Computation Test*, the *Attitude Test*, and the *Choose the Correct Operation Test*. Different forms of these tests were given as pre- and posttests.

The three multivariate hypotheses were tested for statistical significance. The F tests from the MANOVAs are summarized as follows: (1) There were significant differences in the mean scores on the *CTBS*, the *Computation Test*, and the *Choose the Correct Operation Test* between students using *Geometry without Proofs* and students using traditional general mathematics textbooks. In all cases the experimental group was favored. (2) There were significant differences in the mean scores on the *Attitude Test* given in December between students using *Geometry without Proofs* and students using traditional general mathematics textbooks. The experimental group was favored. (3) There were no significant differences in the mean scores on the *Attitude Test given in April* between students using *Geometry without Proofs* and students using traditional general mathematics textbooks.

The findings of this study support the following conclusions: (1) *Geometry without Proofs* is more effective in teaching low achievers computational skills and how to choose the correct operation in solving problems than traditional general mathematics textbooks. (2) For approximately the first half of a school year, *Geometry without Proofs* is more effective than traditional general mathematics textbooks in enhancing the attitudes of tenth grade low achievers towards their mathematics classes. (3) There is no significant difference between the effects of *Geometry without Proofs* and traditional general mathematics textbooks on the attitudes of tenth grade low achievers toward their mathematics class after approximately one year of instruction.

### THE RELATIONSHIP BETWEEN CARDIORESPIRATORY FITNESS AND PERFORMANCE IN BASIC ARITHMETIC SKILLS IN FIFTH-GRADE STUDENTS Order No. DA8318863

Spencer, Helen Patricia, Ed.D. *University of La Verne*, 1983. 132pp.

*The Problem*. The central hypothesis is that students who show a greater improvement in cardiorespiratory fitness will show more of an improvement in basic arithmetic than those students who do not show an improvement in cardiorespiratory fitness; and that the improvement will be greater for those students in the lower ranges of arithmetic performance than for those in the higher ranges of arithmetic performance. The following correlations were done in order to answer the central hypothesis: (1) Correlations between arithmetic performance and fitness performance for boys versus girls, (2) correlations between arithmetic performance and fitness performance for students who received additional cardiorespiratory fitness training as part of their regular physical education program, (3) correlations between the gain scores of students in the high, medium and low ranges of performance in basic arithmetic performance and their gain scores in cardiorespiratory fitness, (4) correlations between cardiorespiratory fitness, performance in basic arithmetic and attendance.

*Research Methodology*. Data derived from a pre-post basic skills arithmetic test, pre-post cardiorespiratory fitness test and attendance gathered from 280 students was treated using the Pearson Product Moment Correlation Coefficient, independent 't' test, related 't' test and chi-square.

*Findings*. (1) There is a correlation between cardiorespiratory fitness and performance in basic arithmetic performance for fifth grade students. (2) there is a significant difference ($p < .01$) in improvement of cardiorespiratory fitness and performance in basic arithmetic performance for students who were in the experimental group versus students who were in the control group. (3) there is a higher correlation between improvement in cardiorespiratory fitness and improvement in basic arithmetic performance for students in the low and medium ranges of performance in basic arithmetic than for students in the higher ranges of performance. (4) there is a negative correlation between days absent and improvement in cardiorespiratory fitness and improvement in basic arithmetic performance for the experimental and control groups.

*Conclusions and Recommendations*. There is a correlation between improvement in cardiorespiratory fitness and improvement in arithmetic performance for fifth grade students. While the correlations found in the study are not large, the positive trend suggests that further investigation would be appropriate. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

### THE EFFECT OF TEACHER IN-SERVICE ABOUT LEARNING STYLES ON STUDENTS' MATHEMATICS AND READING ACHIEVEMENT Order No. DA8318640

Spires, Roger Dewain, Ph.D. *Bowling Green State University*, 1983. 208pp.

The purpose of this study was to determine how teacher in-service about learning style concepts and instructional techniques would affect reading and mathematics achievement of students in kindergarten through sixth grade.

This was a quasi-experimental pretest-posttest study that used existing groups whose members had been assigned heterogeneously. Analysis of covariance was used to control for any pre-existing difference (based on pretest scores and intelligence) between the control and experimental groups.

The learning styles of students in the experimental groups were determined by the Learning Style Inventory (LSI). Teachers of these students used the LSI results to determine instruction best suited for each student. They used the skills and techniques learned in the year long in-service activities to accomodate the students' learning styles. The teachers' teaching style was evaluated by their response to questions on the Teaching Style Inventory.

The major findings of this study are: (1) analysis of the overall pretest-posttest effect shows the experimental students achieved more than the control students in all mathematics and reading subtests. They achieved significantly more on three subtests: word attack, reading comprehension, and mathematics concepts/application; (2) the experimental students scored significantly higher on subtests requiring conceptual skills in four out of seven grade levels; (3) the control students scored significantly higher on subtests requiring rote learning in five out of seven grade levels; and (4) teachers in higher grade levels appeared to use more traditional teaching styles.

### THE INFLUENCE OF CONCEPTUAL DEVELOPMENT TRAINING ON RATE OF LEARNING, CONCEPTUAL SKILL AND ACHIEVEMENT IN LEARNING DISABLED STUDENTS Order No. DA8302708

Spraings, Violet Evelyn, Ed.D. *University of San Francisco*, 1982. 663pp. Chairperson: Hugh D. O'Neill

The purpose of this study is to determine if there are any significant differences between a learning disabled experimental and comparison group in their measured academic achievement in reading (vocabulary and comprehension), mathematics (computation, concepts, and application), spelling, conceptual skills (verbal, quantitative, and on-verbal) and rate of learning subsequent to conceptualization development or cognitive-modifiability training. The Comprehensive Tests of Basic Skills, Form T, (CTBS-T) were used to measure academic skill and the Cognitive Abilities Test to measure conceptual skill. A comprehensive conceptual development training program was developed for the study. Ninety learning disabled elementary, junior and senior high school students were randomly selected for an experimental and control group. The experimental group received fifty minutes/day conceptualization training for 202 school days, and the control group had fifty minutes/day psychomotor training for 202 school days. The study used a randomized control-group posttest only design. Exploratory data analyses included univariate *t* tests between experimental and control groups, univariate ANOVA's by both group and grade level, multivariate ANOVA's for the variables of interest, i.e. I.Q., Cognitive Abilities Test scores and rates calculated from CTBS scores. Discriminant analyses were used to determine which variables best discriminated between the experimental and control groups, the relative contribution of each variable, and the proportion of students who appear to achieve scores similar to those of the mean of their own groups. Cluster analyses were used to derive the common patterns of scores among the students, to identify outliers, and to determine the relationship between these independently derived patterns and the experimental and control groups' pattern.

The conceptualization development program appeared to have been effective at all grade levels with approximately equal performance across grade levels. The experimental and control groups differed significantly in all areas of academic achievement ($p = .001$), all conceptual skills ($p = .001$) and rate of learning ($p = .001$). The study definitively showed the value of conceptual training with learning disabled students at the elementary, junior and senior high school levels.

## TEACHERS CAN DEVELOP A POSITIVE SELF-CONCEPT IN STUDENTS, THEREBY ENHANCING THE STUDENT'S ACADEMIC ACHIEVEMENT

Order No. DA8229613

STANFORD, DELTON G., ED.D. *University of Massachusetts*, 1982. 133pp. Director: Harvey Scribner

The purpose of this study was to determine whether the self concept of students can be enhanced and their academic achievement improved as a result of their major subject teachers (Mathematics, Science, Social Studies, and Language Arts) being exposed to certain educational modifications, principles and techniques designed to purposely enhance the self concept of their students.

The data for this investigation was collected using six intact classes from a junior high school located in a low socio-economic district in New York City. The student population of two hundred and fourteen and their major subject teachers were separated into three groups: (1) Control; (2) Partial Experimental; and (3) Experimental.

The major subject teachers of the partial experimental and the experimental groups were exposed to a series of twenty-six, forty minute workshop sessions over a period of seven months, with the writer functioning as the facilitator for the experimental group and as participant observer for the partial experimental group. The workshop sessions were organized around the following six factors of classroom environment: (1) Control; (2) Respect; (3) Challenge; (4) Success; (5) Warmth; and (6) Freedom. Used in conjunction with the six factors were six activities: (1) Text; *Values Clarification* by Sidney Simon and *100 Ways to Enhance Self Concept in the Classroom* by Canfield & Wells; (2) Interaction-Discussion Groups; (3) Classroom Writing Assignments; (4) Value Clarification Exercise; (5) Role Playing Activities; and (6) Self Confrontation Exercise.

The research design for this experiment was quasi-experimental. The groups were naturally intact classes with no randomixation. The instruments used to assess changes in self concept and academic achievement were the Pier-Harris Self Concept Test titled "The Way I Feel About Myself," and the 1978 edition of the Metropolitan Achievement Test form JH.

The results of *t*-test, analysis of variance and Pearson's correlations favored the experimental group over the partial experimental and control groups. Significant results were obtained for academic achievement and self concept gain scores at the .001 level of significance. Pearson's correlation test results indicated that these students with the lower absentee rate had the higher academic achievement and self concept. The results also indicated that the higher the students self concept the higher his academic achievement.

## A COMPARISON OF ORDINARY LEAST SQUARES AND RIDGE ESTIMATION FOR PREDICTING STUDENT PERFORMANCE FROM THE ALABAMA BASIC COMPETENCY TESTS AND THE CALIFORNIA ACHIEVEMENT TESTS

Order No. DA8303356

STEELE, DEBRA JOYCE, PH.D. *The University of Alabama*, 1982. 188pp.

The primary purpose of this study was to develop and validate a set of prediction models for estimating student performance on the Alabama Basic Competency Tests (ABCT) and the California Achievement Tests (CAT). Both the ordinary least squares method (OLS) and the ridge method for developing the prediction models were utilized to estimate each dependent variable. The dependent variables for both grades 3 and 6 were the ABCT-composite score (ABCT-Comp), the ABCT reading subtest (ABCT-R), the ABCT mathematics subtest (ABCT-M), the ABCT language subtest (ABCT-L), the CAT composite score (CAT-Comp), the CAT reading subtest (CAT-R), the CAT mathematics subtest (CAT-M), and the CAT language subtest (CAT-L). A secondary purpose of the study was to determine whether the OLS or the ridge model provided a more accurate estimate.

The study was conducted using data collected from 46,888 third grade and 42,256 sixth grade students in the public schools of Alabama in 1980. Both grades 3 and 6 were randomly divided into two random samples. The first sample was used as the model specification group. The prediction models specified with the OLS and the ridge ($k = .4950$) models were statistically significant (.05 level) for all dependent variables in grades 3 and 6.

After the OLS and ridge models were specified, both models were used to estimate scores for the dependent variables in the validation group. The OLS and ridge estimated scores were subtracted from the actual observed score for all subjects in each validation group. The difference between the estimated score and the actual observed score was called the residual. A sign test was utilized to determine whether there is a significant difference (.05 level) between the OLS residuals and the ridge residuals. There were significantly (.05 level) smaller residuals for the ridge model in grade 3 for ABCT-Comp, ABCT-R, ABCT-L, CAT-Comp, and CAT-L, and there were significantly (.05 level) smaller residuals for the OLS model for the ABCT-M, CAT-R, and CAT-M in grade 3. In grade 6, the ridge residuals were significantly (.05 level) smaller consistently for all dependent variables. The smaller residuals indicate a more accurate estimate.

## TEACHER ATTITUDES TOWARD COMPUTER LITERACY

Order No. DA8312068

STENZEL, LEROY GEORGE, JR., ED.D. *The Louisiana State University and Agricultural and Mechanical Col.*, 1982. 26pp. Supervisor: Professor Robert E. Spears

A survey on attitudes and perceptions toward computer technology was conducted among 464 teachers in five randomly chosen parishes in the State of Louisiana. In each parish one elementary school, one junior high or middle school, and one high school were randomly chosen. The sample included every teacher in each of the chosen schools. A total of 369 (79.5 percent) surveys were returned. The purposes of the study were to delineate, analyze, and document the reasons that teachers may avoid using computer technology. Lack of opportunity, lack of assistance, and lack of equipment and materials appeared to be the primary obstacles to teacher use of computers in schools.

Findings included the following: (1) Teachers had generally positive attitudes toward computers. (2) A positive relationship appeared to exist between the educational degree possessed by a teacher and the perceptions the teacher had of computers. (3) Age, gender, teaching level, and teaching field did not appear to be significant factors in the predisposition of teachers to learn about computers. (4) A significant relationship appeared to exist between perceptions of negative factors surrounding computers and perceptions of the usefulness of computers. (5) Sixty-three percent of the teachers wanted to learn about computers at their own paces, and over 94 percent wanted to learn using the equipment and materials they will use in their jobs. In-school assistance was not available for 87.7 percent of the teachers in the sample.

The following recommendations were made: (1) That individual computer training programs be made available to all teachers as part of their inservice training. (2) That computer equipment be made available to individual teachers engaged in the training programs. (3) That computer expertise be developed by teachers at various levels. (4) That software packages be developed to allow teachers to utilize classroom computer equipment while building computer skills. (5) That research be conducted to determine needs of individual teachers regarding content and emphasis of programs and depth of computer expertise.

### ABACUS SKILL IN CHINESE CHILDREN: IMAGERY IN MENTAL CALCULATION

**Order No. DA8304606**

STIGLER, JAMES WALTON, PH.D. *The University of Michigan*, 1982. 106pp. Chairman: Harold W. Stevenson

This research is an investigation of the phenomenon of abacus-based mental addition among 11-year-old Chinese children. The children, all trained in abacus calculation, report doing mental calculation by visualizing a mental image of the abacus, and by moving beads on this "mental abacus" as they would on a real abacus. Studying this phenomenon enables one to investigate the nature and function of mental imagery, and the mechanisms involved in acquiring images.

This study had two specific purposes: first, to gather basic information about the abacus and children's skill in both abacus and "mental abacus" calculation; second, to gather evidence that might clarify the nature of the mental representation involved in "mental abacus" calculation.

Three groups of four children each were studied, representing expert, intermediate, and novice abacus operators. Response times and errors were recorded for both abacus and mental addition of a large and varied set of problems. Four American adults also performed mental calculations on the same set of problems. The Chinese children also performed a task requiring them, both mentally and using the abacus, to answer questions about intermediate states in abacus addition problems.

The abacus experts were found to be amazingly fast at both abacus and mental calculation, and faster when using mental solution than when using the physical abacus. Response times for both abacus and mental addition were a linear function of the total number of digits in the problem, calculated as number of digits (per addend) times number of addends. With total digits held constant, number of digits per addend was positively related to Chinese mental calculation time, but not abacus or American mental calculation times.

Several pieces of evidence converged in showing the "mental abacus" to be an analog representation, isomorphic with the structure and function of the physical abacus. Evidence supporting this conclusion were the facts that subjects mentally were able to answer questions about intermediate states unique to abacus calculation, and errors in mental calculation showed that Chinese, but not Americans, made errors predicted from analysis of abacus operation.

### A CORRELATIONAL STUDY OF EFFECTIVE TEACHING BEHAVIORS FOR REMEDIAL COLLEGE MATHEMATICS

**Order No. DA8304048**

STOMPER, CONNIE MARIE, ED.D. *Columbia University Teachers College*, 1982. 135pp. Sponsor: Professor Arno Bellack

The purpose of this study was to empirically derive a model of effective instruction for remedial college mathematics teaching. Specific teaching behaviors utilized by remedial college instructors teaching the same basic algebra curriculum were analyzed to determine those behaviors which distinguished high from low effective instructors.

Selected on the basis of a curriculum average pass percentage for remedial courses, three high effective and four low effective teachers of the full time mathematics faculty of an urban college were videotaped over the course of a semester. An observation instrument coding low-inference variables was developed for analyzing teacher-student verbal interaction. Nine categories containing several variables each were used to analyze the tapes: length of entry, activity, speaker, pedagogical move, focus of utterance, target of questions, answer, feedback sanction and feedback reaction.

Mean frequencies and percentages of 38 single variables and combinations of variables were tabulated. Means and standard deviations were computed for the high and low groups and a t-test was performed for the difference between group means for each item analyzed. Two-tailed tests were used and a p value of less than .10 was considered a significant finding.

The following teaching strategies based on significant findings form a tentative model of effective instruction in remedial college mathematics. (1) Teach using an interrogative rather than a declarative format, including the use of rhetorical questions which may be answered by the instructor as often as they are not. (2) Maximize questions that ask students to perform mathematically and minimize the questions which seek to have them explain what has or should be done. (3) Maximize substantive discourse. (4) Obtain ongoing feedback about student understanding through the use of in class examples, through monitoring the class at work and through direct inquiry. (5) Correct answers need not be explicitly affirmed, but should more often be sanctioned implicitly by repeating the answer. Improve student answers when appropriate.

### A CLINICAL INVESTIGATION OF THE TRANSLATION PROCESS FOR SOLVING WORD PROBLEMS IN ELEMENTARY SCHOOL MATHEMATICS

**Order No. DA8316533**

STONE, ANTHONY PAUL, PH.D. *University of South Florida*, 1983. 195pp. Major Professor: Donovan R. Lichtenberg

The purposes of this study were: (1) to design an instructional sequence with an emphasis on specific translation skills and heuristics that would facilitate the acquisition of translation processes needed to transform word problems to mathematical statements or phrases and (2) to assess the effectiveness of the instructional sequence, while seeking to improve it. Both of these purposes were achieved through a teaching experiment.

The instructional sequence was composed of two series of lessons: (a) seven lessons on specific skills and (b) five lessons on heuristic methods. Heuristic teaching techniques were used by the researcher to lead students, using well-chosen questions, to discover relationships and to learn translation skills.

Two sixth-grade classes were used in the study. The first was used for the teaching experiment (TE-group) and the second was a secondary indicator (SI-group) of the efficacy of the changes made in the instructional sequence based on results with the TE-group.

To evaluate the instructional sequence, data were collected from analysis of test scores on mathematics word problems, interviews, observations, and participant evaluations. The findings indicated that the instructional sequence was successful in developing procedures to aid the learner in translating word problems. The test comparisons showed a steady improvement from one test to the next. There was an overall increase of 10% per individual mean score in the group and about a 20% increase compared to a sample group. The section of each test that proved most difficult to all groups entailed determining information needed to translate the problem into a computational format. There were pronounced increases in the sections demanding efficient usage of specific skills.

Whether the students incorporated heuristic methods into their approach to solving word problems was not apparent in the SI-group, and only somewhat in the TE-group. The long-term effects of the value of learning to use heuristics is beyond the time frame of this study. Nevertheless, the interviews gave some signs that heuristics were being used and the subsequent scores following the lessons on heuristics were favorable.

The findings from this study generated hypotheses for future studies.

## THE EFFECTS OF NEGATIVE INSTANCES AND FOCUSING STRATEGIES ON CONJUNCTIVE CONCEPT LEARNING

Order No. DA8300357

Stout, David Lee, Ph.D. *The Ohio State University*, 1982. 160pp. Adviser: Professor Richard J. Shumway

The effects of negative instances and three focusing strategies were investigated using two conjunctive mathematical concepts: difference of squares and equilateral quadralateral.

Both concepts were delineated along seven dimensions of two features each. Five dimensions were irrelevant. Three of the five irrelevant dimensions had features with .5 prevalency. The remaining two irrelevant dimensions had features with 1.0 prevalency. These simulated teaching situations where features of irrelevant dimensions are difficult, inconvenient, or impossible to manipulate.

Two learning sequences were employed: all positive instances and mixed (positive and negative) instances. The all positive sequence was presented as divergent pairs of positive instances. The mixed sequence was presented as divergent positive instances each matched to a negative instance. Four instances were presented per page. Repetition of instances occurred.

Each sequence was crossed with three focusing strategies: three-, five-, or seven-dimension. The seven-dimension strategy contained both the .5 and 1.0 prevalent irrelevant features. The three- and five-dimension strategies focused only on irrelevant dimensions with .5 prevalent irrelevant features. Six treatments were realized for each concept. The data from the six treatments for each concept were analysed using analysis of variance.

The results of the ANOVAs showed negative instances to be a powerful aid in concept learning in the seven-dimension focusing strategy for both concepts. However, when a three- or five-dimension focusing strategy was used neither learning sequence was found to be favored. Possible explanations are proposed.

## TWO METHODS OF TEACHING MATHEMATICS AND STUDENT ACHIEVEMENT SCORES IN JORDAN SCHOOL DISTRICT

Order No. DA8306263

Stuker, Earl, Ed.D. *Brigham Young University*, 1982. 140pp. Chairman: F. Del Wasden

The purpose of this study was to determine if students would score higher in mathematics computation and problem-solving skills as measured by the ITBS when using GEMS materials as compared to the traditional textbook approach.

There were five experimental schools and five control schools. The experimental schools used the GEMS materials; the control schools used traditional textbooks. The experimental schools did not score higher than the control schools. It was found that the use of the GEMS program was no better than commercial programs for developing computations and problem-solving skills.

## ALGEBRAIC PROBLEM SOLVING: AN ERROR ANALYSIS STUDY

Order No. DA8312542

Sullenberger, Roger William, Ph.D. *University of Pittsburgh*, 1982. 227pp.

The primary purpose for this study was to examine the strategy selection and error production of students while they attempted to solve algebraic problems. The effects that recognition of relatedness among problems, the use of curtailed processes, the presence of flexible modes of thinking and specific checking mechanisms have on students' performances also were considered.

The study was conducted in a rural suburban high school in southwestern Pennsylvania. Twenty-one twelfth grade students were given a Problem-Solving Inventory consisting of six related and complex problems from algebra. During individual problem-solving sessions, the students were asked to "think aloud" as they attempted to solve the problems. The selected strategies and types of errors were identified and classified. Patterns in strategy selection and various errors were examined within and between groups of successful and unsuccessful problem-solvers.

The students' strategies are mostly content-specific. Few general heuristic strategies are applied. The selections of strategies remain relatively consistent across related problems with substitution being the overwhelming preference. Few students employ alternative strategies effectively. Unsuccessful problem-solvers demonstrate a rigidity of strategy selection. Most strategies are applied as algorithms.

The errant behaviors of students range from simple errors involving operations with arithmetic and algebraic symbols to more complex errors involving interpretations and applications of algebraic concepts and principles. Predictable errors result from solving quadratic equations, applying the zero-product principle and transforming equations. Unsuccessful problem-solvers exhibit individual consistencies in the types of errors produced.

In most cases, the use of curtailed processes contributed to the failures of problem-solvers. The students' desires to condense the solution process by performing certain operations mentally lead to elimination of intermediate steps and alteration of information.

## ATTRIBUTIONS FOR FAILURE AMONG LOW AND HIGH SELF-CONCEPT LEARNING DISABLED AND NONDISABLED STUDENTS

Order No. DA8307029

Swedlaw, Shelley Helene, Ed.D. *University of Houston*, 1982. 104pp.

The purpose of this study was to determine whether learning disabled and nondisabled students indicated different attributions for failure at an achievement task; causal preferences were examined for both low and high self-concept students within learning disabled and nondisabled samples. In addition this study investigated whether differences existed in locus of control orientation among learning disabled and nondisabled students.

The sample consisted of 40 students from grades 4 and 5. Based on scores on the *Piers-Harris Children's Self-Concept Scale*, 10 students in each group were identified as having high self-concepts and 10 as having low self-concepts. Each student was administered the LOCITAD, a locus of control measure, and then was given instructions in a novel task (how to divide fractions). Following establishment of a base rate (number of problems completed in 5 minutes), the students were asked to again attain the base rate within the same time span, but were not actually given the entire time to complete the task. They were then asked to attribute their failure to one or more of the following causes: lack of ability, high task difficulty, lack of effort, or bad luck.

Analysis of variance procedures were applied to all measures according to a 2 (Type of Student: Disabled-Nondisabled) x 2 (Self-Concept Level: High-Low) design. Significant *F* ratios were analyzed further using the Newman-Keuls multiple comparison list.

The results indicated that the stability of attributions given differed by type of student: nondisabled students gave more unstable attributions, whereas learning disabled students tended to give more stable attributions. No significant differences were found in locus of control orientation between learning disabled and nondisabled groups.

These findings suggest the importance of examining the relationship between academic attributions and academic performance in order to understand the achievement behavior of learning disabled students. The results of the present investigation also have implications for attribution retraining interventions that may complement the remedial strategies used by teachers.

This study should be replicated in schools of different socioeconomic and ethnic compositions. Further research should utilize a larger number of girls, and might investigate attributions of distinct populations based on type of learning disability and employ a more open-ended attribution assessment format in order to investigate a wider range of possible attributional choices.

### THE DEVELOPMENT AND EVALUATION OF AN INSTRUCTIONAL PROGRAM IN PROBLEM-SOLVING STRATEGIES FOR SECOND YEAR ALGEBRA STUDENTS

Order No. DA8322686

**Swoope, Regina Borinsky**, Ed.D. *Clark University*, 1983. 321pp.
Chief Instructor: David S. Zern

*Purpose*. This quasi-experimental study was conducted to assess the effects of an investigator-designed, ten-week instructional program in mathematical problem solving. The hypotheses were advanced that high school second year algebra students who were exposed to the instructional program would (1) show greater improvement in problem-solving performance as measured by a mathematics section of a Scholastic Aptitude Test (SAT) and (2) exhibit more strategy usage in their written responses to mathematical problem sets that were constructed by the investigator than students who were not exposed to the instructional program.

*Procedure*. The population consisted of 92 students who were enrolled in either an honors or a standard level of second year algebra in one senior high school. A pretest-posttest research design that featured three control groups and two experimental groups was used.

The independent variables were treatment (experimental/control), computational skill level (I/II/III), course descriptor (honors/standard), and sex (female/male). Dependent variables included problem-solving performance as a product measure and strategy usage as process measures. Strategy usage encompassed 28 process variables that were operationalized by assigning scores to coded written student responses for mathematical problem sets.

Each of the dependent variables--product measure and 28 process variables--were analyzed separately. Analyses of covariance were performed using posttest scores for the criterion variable and corresponding pretest scores as the covariate to determine the effects of the instructional program. Two phases of analyses were conducted. Each phase employed a classic four-group experimental/control group design and involved two sets of analyses. SET I for each phase involved the independent factors of treatment, sex, and course descriptor; SET II involved treatment, sex, and skill level.

*Findings and Conclusions*. In general, instructing students in strategies and techniques of problem solving had no marked effect on their problem-solving performance, as measured by the SAT. It should be noted that experimental group means were higher, but not to a significant degree.

Results of analyses indicated in a consistent manner that treatment did influence students' strategy usage and that the experimental group means were significantly higher. These findings confirm that strategies and techniques can be learned by students within the context of a second year algebra course, and that students who learn the strategies and techniques use them when solving mathematical problems.

### THE EFFECTS OF KNOWLEDGE-BASED INSTRUCTION ON THE ABILITIES OF PRIMARY GRADE CHILDREN IN ARITHMETIC WORD PROBLEM SOLVING

Order No. DA8303643

**Tamburino, Joseph Louis**, Ph.D. *University of Pittsburgh*, 1982. 269pp.

The purpose of this study was to investigate the effects of teaching students to solve arithmetic word problems by developing diagrammatic representations on the following abilities of primary grade children: (1) solving word problems, (2) modeling problems, (3) understanding part-whole relationships, and (4) transferring diagrammatic strategies to complex problems not included in the instructional sequence. Another purpose was to examine the roles of the different types of knowledge involved in arithmetic word problem solving.

Subjects for the study were twenty-two primary grade students. All students were pre- and posttested in the following areas: one-step word problems, knowledge of part-whole relationships, addition and subtraction open sentences, and a transfer test. Following pretesting pairs of students were matched on the basis of similar pretest scores. One student from each pair was then randomly assigned to one of two instructional treatments, A or B. Treatment A received instruction on specific problem solving strategies (word problem diagrams) and on part-whole relationships (relationship diagrams). Treatment B received instruction only on the problem solving strategies. The treatment consisted of twenty-two daily instructional sessions, each of approximately forty minutes in duration.

A two-way analysis of variance with repeated measures was used to test the six hypotheses followed by a qualitative analysis of the students' performances under both treatment conditions. Results showed that both treatment groups improved significantly on all dependent variables. Instruction also affected student performances on the different types of word problems. In analyzing the types of strategies utilized in solving one-step problems, the data revealed that the students in Treatment B were quite uniform with respect to the diagrams used, whereas those in Treatment A were more varied. The predominant strategies used in transfer situations were extensions of specific diagrams that modeled the one-step problems.

The results suggest that a good diagram can represent all the essential types of knowledge required for word problem solving. These findings have instructional implications for the primary grade teacher in that the diagrams should not be taught as algorithms but as schemes for representing information in a meaningful form that can be used to analyze problem situations.

### A COMPARISON OF THE EFFECTIVENESS OF USING AND NOT USING MANIPULATIVE MATERIALS IN TEACHING ADDITION AND SUBTRACTION TO FIRST GRADE STUDENTS IN BANGKOK, THAILAND

Order No. DA8322128

**Tanbanjong, Aurapun**, Ed.D. *University of Houston*, 1983. 121pp.

*Purpose*. The purpose of this investigation was to examine the effects of using manipulative materials on the mathematics achievement of first grade students in Thailand.

*Procedure*. The subjects consisted of 350 first grade students in Bangkok, Thailand.

The experimental group and comparison group were given a Pretest before the study began. Each group received instruction for six weeks.

The study utilized an experimental group-comparison group design. Equated experimental and comparison groups of first graders were used to make a comparison of the effect of using and not using manipulative materials when teaching addition and subtraction.

A posttest was administered at the completion of the treatment. A One-Way-Analysis of Variance was used to analyze the data.

*Conclusions*. The children who were taught with manipulative aids scored significantly higher on the achievement test than the children who were taught without manipulative aids at a .05 level of probability.

*Implication and Recommendations*. The results of this investigation has implications for both mathematics instruction and mathematics education. The results indicate: (1) Mathematics educators in Thailand should developed simple inexpensive manipulative materials for the mathematics program and prepare teachers to use them. (2) Primary grade teachers in Thailand might increase their effectiveness by incorporating the use of manipulative aids into their instructional methodology when teaching addition and subtraction. (3) The use of manipulative aids in instruction facilitates children's acquisition of concepts and skills in addition and subtraction of whole numbers.

### THE RELATIONSHIP OF SKILLS IN ARITHMETIC COMPUTATION, WORD RECOGNITION, AND INTERPERSONAL RELATIONS TO JOB PERFORMANCE

Order No. DA8319203

**Thayer, Constance Johnson**, Ph.D. *The University of Connecticut*, 1983. 163pp.

The purpose of this study is to investigate the extent and manner in which an individual's job performance may be predicted by acquired skills in arithmetic computation, word recognition, and interpersonal relations. The specific objective is to identify which of these skills is the best predictor of an individual's job performance. One hundred adults, employed full-time, are selected from the work force. In order to assure that each of the nine occupational categories defined by the U.S. Department of Labor, Bureau of Labor Statistics (1976) contributes to the sample in proportion to its size in the labor force of the state of Connecticut. The arithmetic and reading subtests of the Wide Range Achievement Test (Jastak & Jastak, 1978) are administered to participating employees during interviews conducted at the workplace. On-the-job performance and ability to deal with others are rated on a graphic rating scale which is completed by the employee's supervisor.

The results on the measures of the predictor variables (skills in arithmetic computation, word recognition, and ability to deal with others) are analyzed using a multiple discriminant function analysis procedure. The analysis generates one discriminant function equation which is applied to classify individuals into groups according to their level of job performance.

Several findings are reported. An individual's rating on the measure of interpersonal skills is the strongest determiner of whether that individual is evaluated as a high, average, or low performer on the job. Workers in the high performing group are distinctly different from workers in the low performing group with respect to interpersonal skills. Interpersonal skills account for 51% of the variation among the three groups. Skills of arithmetic computation and word recognition do not distinguish among workers identified by their supervisors as high, average, or low performers.

## THREE METHODS OF REDUCING MATH ANXIETY IN WOMEN

Order No. DA8311453

THEMES, ELLEN PATRICIA, PH.D. *Kent State University*, 1982. 156pp.
Co-Directors: Leo W. Anglin, Marijane Werner

The following three methods of reducing math anxiety in women were compared: Ellis' Rational-Emotive Therapy, Meichembaum's cognitive behavior modification, and math skills intervention. Also to be determined was the extent of relationship between math anxiety and background variables, and between math anxiety and causal attribution variables.

The sample was a group of 61 women, ranging in age from 18 to 60, from a small, private college in Northeastern Ohio. Each of the three groups met for six weekly sessions, lasting 75 minutes each, in the Spring of 1982. Participants were dropped if they missed more than one session. The Differential Aptitude, Numerical Ability Subtest, Form S (DAT; Bennett, Seashore, & Wesman, 1973), was used to measure achievement; the Mathematics Anxiety Rating Scale (MARS; Suinn, 1972), to measure math anxiety; and a causes assessment scale (Spies, 1981), to measure causal attribution.

A two-way analysis of variance, repeated measures design, was performed on the MARS. All groups reduced math anxiety scores significantly from pretest to posttest, from pretest to follow-up, and from posttest to follow-up, but no group emerged as the method of choice. Pearson correlation coefficients were computed for math anxiety with background variables and with causal attribution variables. The correlation of the MARS with the DAT was significant, but the MARS with Math GPA, age, number of courses, and length of time since the last math course was not. The MARS was also significantly correlated with these causal attribution variables: ability level, difficulty of math, luck, help or lack of help from others, and effort. It did not correlate significantly with mood, current achievement or the way teachers presented math.

A multiple regression analysis was performed with the MARS as dependent variable. The following variables emerged as predictors: ability level, luck, and the sum of the causes. When a multiple regression analysis was performed with the DAT as dependent variable, the predictors were age, Math GPA, and help from others.

## KINDERGARTEN TEACHERS' ELICITATION AND UTILIZATION OF CHILDREN'S PRIOR KNOWLEDGE IN THE TEACHING OF SHAPE CONCEPTS

Order No. DA8307701

THOMAS, BETSY HARTNESS, PH.D. *New York University*, 1982. 354pp.
Chairperson: Professor Margot Ely

The purpose of this study was to investigate the teaching-learning process in order to describe how teachers used children's existing knowledge as a basis for further learning. The particular curriculum content of shape concepts was chosen for this investigation.

Four research questions focused on: children's knowledge of shape concepts prior to a teaching session on shape; the nature of teacher-child interactions during the teaching session; each teacher's stated objectives for a teaching session in relation to the actual teaching session; the relation between children's prior knowledge of shape and the teaching session on shape.

A naturalistic methodology was applied to a sample of five kindergarten teachers in urban day care centers and 21 five year old students.

Children's prior knowledge was determined by a Children's Shape Concept Interview (CSCI) developed for this study. Results indicated that children had substantial knowledge of shape before the teaching sessions.

One teaching session for each teacher who worked with four to five children was audio-taped and analyzed. The most frequent pattern of teacher-child interaction was one in which the teacher elicited and verified prior knowledge, but did not add content or develop new knowledge. Four of five teachers were frequently unclear in presenting and implementing content. A high proportion of questions were closed and the majority of responses were at the memory level.

In all five classes, children's prior knowledge of shape as determined by the CSCI was elicited but not utilized. Teachers elicited children's prior knowledge in areas where children had highest prior knowledge ratings. Thus, teachers focused on familiar content and did not develop new knowledge. In two classes however, prior knowledge of content not determined by the CSCI was elicited and utilized minimally.

The objectives described by teachers in pre-teaching interviews were narrow and did not refer to teaching-learning processes. The content of teaching sessions related to objectives to varying degrees. All teachers stated in post-interviews that they had met their objectives. None talked of the ways in which these objectives were met.

## AN ANALYSIS OF SEX DIFFERENCES IN TEACHER-STUDENT INTERACTION IN ELEMENTARY/SECONDARY AND POSTSECONDARY MATHEMATICS/SCIENCE AND COMPOSITION/LITERATURE/LANGUAGE ARTS CLASSROOMS

Order No. DA8322784

THOMAS, DAWN FRANCES, PH.D. *The American University*, 1983. 231pp.

This exploratory field study had three purposes: to determine sex differences in postsecondary teacher-student classroom interaction, to compare relationships between sex bias and interaction patterns in elementary/secondary and postsecondary classes, and to contribute information on equity and interaction in postsecondary education.

Minor modifications were made to the INTERSECT Observation System (developed by The Network, Inc., for Project INTERSECT's elementary/secondary study) to collect postsecondary data. Similar collection methods allowed for comparisons between postsecondary and elementary/secondary classes.

Total sample size was 64 classes/60 teachers: the elementary/secondary population had 30 classes/28 teachers in mathematics/science and language arts for grades four, six, and eight; the postsecondary population had 34 classes/32 teachers in mathematics and composition/literature classes for majors and nonmajors. Each class was observed twice.

This study found approximately one-third more teacher-student interaction in elementary/secondary classes than in postsecondary. At all educational levels, males got more teacher interaction than expected and females less (coefficient of distribution, ± 4%). This inequity increased over time. However, the bias against females was greater in elementary/secondary classrooms.

Elementary/secondary and postsecondary teachers used acceptance interactions the most frequently when responding to students (elementary/secondary, 53%; postsecondary, 65% of total interactions), followed by remediation (elementary/secondary, 31%; postsecondary, 33% of total interactions). These teachers rarely used praise and criticism. Similar patterns were found for the four types of intellectual interactions.

Conduct, "other," and student-initiated interactions, and student call outs were more reflective of elementary/secondary education; they rarely occurred in postsecondary classes. There were no main effects for subject matter differences in teacher-male/female student interaction at any educational level. There was a rare interaction effect between subject matter and institution level.

The postsecondary students in this study appeared to receive a more equitable education than the elementary/secondary students. Higher education classes appeared to offer a "blander" education. There was less student participation and less diverse teacher response to student comments.

### TEACHERS' CONCEPTIONS OF MATHEMATICS AND MATHEMATICS TEACHING: THREE CASE STUDIES

Order No. DA8228729

**Thompson, Alba Gonzalez**, Ed.D. *University of Georgia*, 1982. 329pp. Director: Thomas J. Cooney

The study investigated three junior high school teachers' conceptions of mathematics and mathematics teaching and the relationship between conceptions and practice.

The assumption leading to the study was that teachers' beliefs, views, and preferences about mathematics and its teaching whether consciously or unconsciously held, play a significant role in shaping their characteristic behavior. To the extent that conceptions influence behavior, any attempt to improve the quality of mathematics teaching must begin with an understanding of the teachers' conceptions and their relationship to practice.

Case studies of three junior high school mathematics teachers were conducted, each lasting approximately four weeks. Class observations and stimulated recall sessions were used to gather the data.

The findings supported the original assumption. Teachers' beliefs, views, and preferences about mathematics and its teaching play a significant, albeit subtle, role in shaping their behavior. The teachers' views about mathematics were, in general, reflected in their instructional practice. Each teacher had a prevailing view of mathematics. Differences in the views were related to differences in the teachers' characteristic instructional modes. An inconsistency observed in each case was between the teacher's belief in the relevance of mathematics and her failure to discuss practical applications of the topics taught. Another inconsistency was in one teacher's verbal expression of a preference for activities requiring logical reasoning and her use of a purely prescriptive teaching approach.

The teachers differed markedly in their tendency to reflect upon their actions vis-a-vis their students, beliefs, and the subject matter. Greater reflectiveness appeared to result in more integrated conceptions, and these resulted in greater consistency between conceptions and practice.

### THE TEACHER PERCEIVER INTERVIEW AS RELATED TO STUDENT ACHIEVEMENT

Order No. DA8301182

**Thompson, Albert Ray**, Ed.D. *University of Northern Colorado*, 1982. 100pp.

Instruments that will provide school administrators valid guidance in the selection of teachers who can more effectively help children learn are in high demand. The *Teacher Perceiver Interview* (TPI) claims to provide this guidance by assessing a teacher's skill in developing a positive working relationship with pupils.

The validity of the TPI to identify more effective teachers has been questioned due to a lack of research showing a high degree of association between TPI scores and teacher competence in the classroom. This study searched for evidence of a relationship between TPI scores and student achievement test scores.

Twenty-seven fourth and fifth gra[illegible]chers in the Douglas County (Colorado) School District were administered the TPI. The scores of their students for two successive years on the mathematics, reading and language arts portions of the Comprehensive Test of Basic Skills were also collected. These data along with the teacher's years of prior teaching experience at the same grade level were analyzed using multiple regression and Chi-square techniques.

The study found that teachers' total TPI scores could not be predicted by their years of prior experience or the mean achievement gain scores in mathematics, reading and language arts of their students. However, these same four factors could predict teachers' scores on one part of the TPI that deals with individualized perception.

A negative relationship was found between teachers' TPI scores on Individualized Perception and the academic growth of their students in mathematics and language arts. No relationship was found between Individualized Perception and student growth in reading or years of prior experience at the same grade level. No relationship was found between student gain scores in mathematics, reading or language arts and the total TPI scores of their teachers.

Further research was suggested to investigate the relationship between TPI scores and student academic growth using different achievement measures, and between a teacher's individualized perception and student achievement using instruments other than the TPI. It was recommended that future studies of this type concentrate on grades one and two where other research has shown teachers to have higher TPI scores.

### PROGRAMME FOR THE IMPROVEMENT OF THE PRE-SERVICE MATHEMATICS EDUCATION OF SECONDARY TEACHERS AT THE TEACHERS COLLEGE IN JAMAICA

Order No. DA8304059

**Thompson, Assad John**, Ed.D. *Columbia University Teachers College*, 1982. 428pp. Sponsor: Professor Paul Rosenbloom

The purpose of the study was to develop and if possible begin to evaluate an improved program for the preparation of the secondary school mathematics teachers in the teacher training colleges of Jamaica.

To place the importance of the study in its true perspective, the role of education in general and mathematics education in particular was examined for its implications for economic development particularly in developing countries. Certain aspects of Jamaica's economy were examined. The new developments in industry and services including education were surveyed and an overview of the total education system presented. The current preservice mathematics education programme was described.

A number of problems and critical issues facing Jamaica's mathematics education were uncovered and discussed. Due to recent developments there now exists a greater demand for mathematically trained personnel. School enrollments especially at the secondary level have increased considerably and as a consequence there has arisen a shortage of adequately prepared mathematics teachers.

There are two systems of teacher preparation in Jamaica. In the first place, teachers of Secondary High Schools are prepared at the University of the West Indies in the Faculties of Natural Science, or Arts and General Studies and then at the School of Education. In the second place teachers for the New Secondary Schools are prepared at the Teacher Training Colleges where they receive their academic and pedagogical preparation simultaneously.

In light of recent developments in curriculum improvements for the secondary schools and also in light of what is currently being taught at the teachers colleges, and bearing in mind that any real improvements in mathematics education must first begin at the teachers college, a set of criteria for the preparation of teachers of mathematics were proposed. These criteria were then examined for the implications for mathematics education in Jamaican teacher training colleges. On the basis of these criteria, a set of guidelines was then proposed.

Using these guidelines the present preservice programmes in mathematics were analysed and found to be inadequate. The present programmes lagged behind modern development in mathematics and did not lay a sufficient foundation for the study of mathematics even at the undergraduate level. A new mathematics programme was then proposed and the means of its implementation were discussed.

The study concluded with recommendations, some for immediate action and others for delayed execution.

### INTERACTION OF GENERAL REASONING ABILITY AND LOCUS OF CONTROL AS PREDICTORS OF ACHIEVEMENT IN COLLEGE ALGEBRA Order No. DA8309204

THOMPSON, TOMMY JOE, PH.D. *The University of Texas at Austin*, 1982. 217pp. Supervisor: L. Ray Carry

A two-part experiment designed to clarify the relationship between selected aptitudes and treatments in the community college and their effects on achievement in mathematics is reported. General reasoning ability and locus of control were the two aptitudes chosen for this investigation. Complete data were obtained on 100 students for the first part of the experiment and 43 students for the second part at Brookhaven College, Dallas, Texas.

In the first part of the experiment, two differing sets of instructional materials were distributed to students for studying first-degree equations and functions. One set of materials, high-support, was designed to clarify the organization of the content for the learner. The other set of materials, low-support, was designed to place a greater degree of responsibility on the learner for organizing and processing the content. The criterion measure was a 26-item, multiple-choice achievement test constructed to measure learning after the two 50 minute instructional booklet periods.

The second part of the experiment was a long-range experiment conducted over the entire semester. One college algebra class was taught in which the instructor was responsible to a high degree for giving the organization and reasoning of the content of the course. This class was termed a high instructional support mode. The other class, low instructional support, was taught in a manner in which students had a greater degree of responsibility for organizing and reasoning and determining how material that was presented was related. The criterion measure for the final examination was a 51-item, multiple-choice achievement test.

Some conclusions drawn from this study were: (1) The treatments, both written booklets and expository teaching modes, were not substantially different in producing learning among the students retained. (2) There was an interaction between high-support and low-support teaching modes, general reasoning ability, and locus of control in predicting mathematics achievement in the community college ($p = .05$). However, the direction of the result was unexpected.

The completion rate for all sections of college algebra for the Spring semester was 55%. In the low-support section, the completion rate was 50%, while in the high-support section the completion rate was 81%.

### ASSOCIATIVE ERRORS IN CHILDREN'S ANALOGICAL REASONING: A COGNITIVE PROCESS ANALYSIS
Order No. DA8310018

TIRRE, WILLIAM CHARLES, PH.D. *University of Illinois at Urbana-Champaign*, 1983. 256pp.

Previous research has suggested that reliance upon association in analogy solution indicates a cognitive style that impairs learning and limits the predictability of achievement by intelligence. Experiment 1 investigated the hypothesis that the achievement-intelligence relation is moderated by associative responding. Experiment 2 adopted the Sternberg componential framework to explore the cognitive processes underlying logical and associative errors on the Children's Associative Responding Test (CART).

Achievement test scores were obtained on two samples of 5th and 6th graders. The predictors were intelligence, CART associative errors, and their product. In 18 regressions, the associative score explained variance unexplained by intelligence in 11 cases, moderated the effect of intelligence for English and Mathematics, and came close for two additional cases involving Mathematics. It was concluded that only modest evidence exists for the moderator effect but that associative responding and intelligence reflect distinct cognitive processes.

In the second study, the cognitive processes underlying the error types were compared and contrasted. Paper-and-pencil tasks were devised to measure encoding, inference, mapping relations, and response evaluation. Also measured were vocabulary, semantic flexibility, and working memory capacity. Factor analysis resulted in four primary factors: vocabulary, encoding processes, inductive reasoning and semantic flexibility, and response evaluation, and a higher order general factor.

Further regression analysis showed that only mapping relations did not significantly predict the two CART scores. Despite considerable criterion overlap, vocabulary and inductive reasoning were more highly related to non-associative errors, and working memory and semantic flexibility were more highly related to associative errors.

These findings can be interpreted to mean that when association is not available or is avoided as a solution strategy, great reliance is placed upon vocabulary and inductive reasoning. However, when association is employed as a strategy, this could be due to limited working memory capacity and perhaps to inflexibility in determining word meanings.

### AUDIO TAPES USE IN BILINGUAL MULTIPLICATION INSTRUCTION Order No. DA8316512

TIU, PAUL CHI-HUNG, ED.D. *University of the Pacific*, 1983. 85pp. Chairman: Dr. John Schippers

The purpose of this study was to investigate the effectiveness of a set of Chinese bilingual tapes for multiplication instruction. These tapes, called the Tiu Multiplication Tapes (TMT) were initially developed for learning centers and individualized instruction.

The problem was to determine whether the use of the TMT would be a more effective procedure for reinforcement of multiplication facts than an equal amount of time spent on traditional reinforcement activities. The study also attempted to determine whether there was a higher retention rate resulting from the use of either of the two. A comparison on the Comprehensive Tests of Basic Skills (CTBS) mathematics gain score of the two groups was also made to see if there was a significant difference.

The two hypotheses investigated were: *Hypothesis I*. There would be no difference in the pupils' achievement in the multiplication facts between those using the TMT and the traditional reinforcement activities in (a) the post-test scores and (b) the delayed post-test scores. *Hypotheses II*. There would be no difference in the performance between those pupils using the TMT and the traditional activities in the overall mathematics progress mean gain scores of their third grade CTBS in mathematics.

The research methodology was quasi-experimental where one experimental group and one control group were used. The collected data from the pre-tests, post-tests, the delayed post-tests, and the CTBS mathematics gain scores, were used for statistical analysis.

The findings indicated no significant difference between the two methods of reinforcement. While not at the significant level, the average measured scores of the treatment group out-performed the control group in every respect.

In conclusion, the TMT could be a valuable tool for reinforcement and individualized instruction on learning multiplication facts. It is recommended that replication of the study be made in other languages.

### SEX DIFFERENCES IN COGNITIVE PERFORMANCE ON PIAGET-LIKE TASKS: A META-ANALYSIS OF FINDINGS
Order No. DA8303006

TOHIDI, NAYEREH ESFAHLANI, PH.D. *University of Illinois at Urbana-Champaign*, 1982. 92pp.

A meta-analysis of findings from 70 American and foreign studies comparing school-aged boys' and girls' performances during 1965-81 on Piaget-like tests of cognitive functioning was conducted. The results showed a small but rather consistent sex difference in favor of males. With a slight superiority of girls in classification and seriation, boys slightly but consistently outperformed girls in the cognitive operations such as conservation, spatial visualization, proportional reasoning, disembedding, and field articulation. The overall magnitude of effect size, however, was small than that which is generally implied (ES = .32). The means for boys and girls are actually less than half a standard deviation apart. The analyses of variance and regression analyses yielded the following independent variables as significant in explaining the variance in the value of effect size: cognitive domain, response mode, region of country, sample selection, and type of community. Year of publication, type of task and task characteristics in combination with sample selection and sample characteristics explained only 31% of the variance. Problems and concerns related to methodological quality of the synthesized studies are discussed, and some practical implications are offered.

## EFFECTS OF AN ANXIETY MANAGEMENT TREATMENT ON MATHEMATICS ANXIETY

Order No. DA8227730

Toliver, Peggy Jean, Ph.D. *The University of Texas at Austin*, 1982. 101pp. Supervisor: Ralph W. Cain

This study was designed to determine the effectiveness of using an anxiety management treatment in the classroom to reduce mathematics anxiety and to improve mathematics performance. The study focused on two questions: (1) Will anxiety management training conducted in a regular classroom setting reduce mathematics anxiety? and (2) Will anxiety management training conducted in a regular classroom setting increase mathematics performance?

The subjects of the study were 160 students in eight mathematics classes--four classes of mathematics for elementary education majors at The University of Texas at Austin (Groups I and II) and four classes at Georgetown High School, two in honors algebra (Group III) and two in Calculus (Group IV). The classes were paired by subject and instructor, with each pair contributing one experimental and one control group.

All classes were pretested and posttested using the 40-item Mathematics Anxiety Rating Scale (MARS) to determine mathematics anxiety. The Differential Aptitude Test, Form T, Numerical Ability (DAT) was used (pretest-posttest) to determine changes in mathematics performance.

Treatment for the experimental groups was a multi-faceted anxiety management training of six class days' duration based on treatments developed by Richardson and Suinn (1973), Meichenbaum (1977), and Woolfolk and Richardson (1978). Included were muscle relaxation techniques and self-talk (internal dialogue).

Significant reductions in mathematics anxiety were found in Groups I and III, and in the combined Groups I and II. Significant increases in mathematics performance were found in Groups II and IV only. Significant correlations between mathematics anxiety and mathematics performance were found in Groups I and II, and in the combined Groups I and II.

It was hypothesized that anxiety management training would reduce mathematics anxiety; this was supported by some of the groups, but not all. It was also hypothesized that anxiety management training would increase mathematics performance; this was supported by some groups, but not all. In addition, conflicting results were found on the hypotheses concerning correlations between mathematics anxiety and mathematics performance.

## THE EFFECTS OF HEURISTIC TEACHING AND INSTRUCTION IN PROBLEM-SOLVING ON THE PROBLEM-SOLVING PERFORMANCE, MATHEMATICS ACHIEVEMENT, AND ATTITUDES OF JUNIOR COLLEGE ARITHMETIC STUDENTS

Order No. DA8307537

Truckson, Erika B., Ed.D. *University of Cincinnati*, 1982. 167pp. Chairman: Dr. Jeffry Gordon

The primary purpose of the study was to learn if junior college arithmetic students' problem-solving abilities increase when they are taught problem-solving by heuristic or conventional methods. The secondary purpose was to determine the effects of heuristic teaching and the instruction in problem-solving upon the arithmetic achievement and attitudes toward mathematics of the same students.

The study was conducted at a junior college located on the main campus of a state university in Ohio. The sample consisted of 139 freshmen enrolled in six sections of Basic Mathematics I. The length of the instructional period was nine weeks plus one week for testing.

The classes were taught by two full-time instructors with similar educational backgrounds. Each instructor taught three classes and for each class used one of the following instructional methods: (1) heuristic teaching with problem-solving, (2) conventional teaching, and (3) conventional teaching with problem-solving.

The results of the multiple analysis of covariance indicated that there was no significant difference between the process-product scores for the problem-solving test. The analysis from process measure assessments, however, showed that there was a significant association between the use of heuristics in obtaining a solution and the students taught by different instructional methods. A chi-square test used on data of process measures provided the evidence that students who were taught problem-solving used significantly more heuristics than the students who did not receive this training. The students taught by a heuristic method, however, were more successful in obtaining the solution or came much nearer to the solution than the students taught by the conventional method with problem-solving. The conclusion was that junior college arithmetic students who are taught problem-solving by a heuristic or a conventional method show a substantial increase in their problem-solving skills and performance.

The results of the multiple analysis of covariance showed that the three instructional groups did not differ significantly in achievement of arithmetic skills or in attitudes toward mathematics. Thus the conclusion was that heuristic teaching with problem-solving or conventional teaching with problem-solving have no significant effect on junior college arithmetic students' achievement or attitudes toward mathematics.

## MATHEMATICS ACHIEVEMENT AND COGNITIVE FACTORS IN SPINA BIFIDA CHILDREN WITH HYDROCEPHALUS

Order No. DA8320940

Tuleya-Payne, Helena, D.Ed. *The Pennsylvania State University*, 1983. 172pp. Adviser: Joseph L. French

In this study, attempts were made to confirm the presence of mathematical skill deficits in children with spina bifida and hydrocephalus, a finding suggested by parents and teachers but investigated by few researchers. Specific factors of the Wechsler Intelligence Scale for Children--Revised, i.e., Verbal Comprehension, Perceptual Organization, and Freedom from Distractibility, which may affect and/or aid in the prediction of mathematics achievement were also studied. Based on the literature, the Freedom from Distractibility factor was hypothesized to be the best predictor of mathematics achievement.

Thirty children with spina bifida and hydrocephalus were administered a battery of psycho-educational measures in order to assess mathematics skills and intellectual functioning. The children were ages 10 through 13, enrolled in 5th, 6th, or special education class placements (e.g., learning disability, physically handicapped), and had Full Scale WISC-R IQs of 80 or above. Each child was evaluated on the following measures: (a) WISC-R (the 10 regular subtests and Digit Span), (b) California Achievement Test (CAT), Form C, Level 15 (subtests Mathematics Computations, Mathematics Concepts and Applications, Reading Comprehension, and Reading Vocabulary), (c) Key Math Diagnostic Test (subtests Addition, Subtraction, Multiplication, and Division), and (d) the Developmental Test of Visual-Motor Integration (VMI).

The children in the sample gave significantly weaker performances on both CAT mathematics subtests than on the reading subtests. No differences across the arithmetic operations of the Key Math were noted. The most frequent type of errors were defective algorithms and elimination of details. The best prediction of CAT mathematics achievement was made by using either the WISC-R Verbal IQ or the Verbal Comprehension factor score. The findings suggested that Freedom from Distractibility must be used cautiously as a measure of numerical facility in spina bifida children with hydrocephalus due to the effects of fine motor coordination on the performance of Coding, one of the subtests composing the factor.

The findings supported clinical and research findings citing relatively weak mathematical skills in this population. Neurological deficits may contribute to weak skill development. Teachers are encouraged to review carefully arithmetic assignments of these children to determine illogical mathematical reasoning or repeated omission of details. Class placements should reflect educational needs rather than physical handicaps.

## COGNITIVE CORRELATES OF ARITHMETIC PERFORMANCE IN CLINIC REFERRED CHILDREN

TUOKKO, HOLLY ANNA, PH.D. *University of Victoria (Canada)*, 1983. Supervisor: Dr. Louis D. Costa

The purpose of this research was to investigate, from quantitative and qualitative viewpoints, the relationship between cognitive functioning and arithmetic performance. Using multiple correlations, the performance of one hundred and thirty-five clinic-referred children on the Arithmetic subtests of the Wechsler Intelligence Scale for Children (WISC) and Wide Range Achievement Test (WRAT) was examined in relation to performance on Verbal, Spatial and Memory dimensions (as measured by the WISC). In addition, a subtyping procedure was used to examine whether the pattern of Arithmetic performance was related to pattern of cognitive abilities. A replication of the preceeding was undertaken on a sample of three hundred and fifteen school-referred children. The qualitative approach involved analysis of errors made on arithmetic-related tasks by eighteen learning disabled children.

The results indicated that the Verbal and/or Memory dimensions consistently contributed to arithmetic performance although the relative contributions of each varied by sex, age and across samples. Qualitative analysis of the performance of children with severely impaired Verbal and Memory abilities was characterized by errors reflecting impaired recollection of basic facts and faulty acquisition of certain mathematical concepts. Contrary to expectations, the Spatial dimension only contributed to the Wechsler Arithmetic subtest for the second sample.

Pattern of cognitive ability had no relationship to the pattern of Arithmetic performance but level of Verbal and Memory abilities differed in relation to pattern of Arithmetic performance.

It was suggested that Spatial ability is necessary to acquire an appreciation of numeration and serves as a basis for the development of mathematical ability but beyond this basis, the degree to which an individual acquires the ability to abstract plays a role in arithmetic performance. Implications and suggestions for future research are briefly presented.

## ETHNIC DIFFERENCES AND THE EFFECTS OF TEST-WISENESS TRAINING ON VERBAL AND MATH ACHIEVEMENT

URMAN, HAROLD NEAL, PH.D. *University of Southern California*, 1982. Chairman: Professor Dennis Hocevar

This study was designed to investigate whether training in test-wiseness skills in ethnically diverse groups of elementary school children can enhance scores in reading and math achievement, and whether the effects of test-wiseness training would be influenced by a child's race.

The sample consisted of third and fifth grade students from three elementary schools. The sample contained 123 Hispanic, 66 Black, and 76 White students. Because random assignment of subjects was not possible, the test-wiseness training condition was randomly assigned to one of two third and fifth grade classrooms within each of the three schools. One week following pretesting, with the Stanford Achievement Test in verbal and math achievement, the training group received three 30 minute test-wiseness lessons. Based upon the Test-wiseness Tips Manual developed by the investigator, the skills of following directions, use of time, guessing strategies, and answer changing were taught by trained teachers who devoted 20 minutes to teaching two of the four skills, and 10 minutes to practicing the skills on test items similar to ones used in the pre- and posttesting. Two days following training all students were posttested using the same test and procedures as utilized on the pretest.

Regression analyses controlling for pretest scores in verbal and math achievement were used to analyze the data. Results showed that test-wiseness training produced significant increases in verbal achievement for third grade subjects, and math achievement of fifth grade students. There was, however, no significant test-wiseness training by race interaction.

Implications drawn suggest that future research devote more time to training, that less diversity in achievement within and across subgroups be attained so that content knowledge would not overshadow the effects of training, that test-wiseness training in other content areas beyond verbal achievement be further investigated, and that more attention be given to separating the direct (e.g., following direction) and indirect (e.g., motivation) components of test-wiseness training. Finally, from a practical perspective, teachers should focus on incorporating test-wiseness training daily classroom teachings, in order that students become more familiar with the testing process.

## THE RELATIONSHIP BETWEEN SCHOOL SCALE AND STUDENT OUTCOMES: A COMPARATIVE CASE ANALYSIS

Order No. DA8300396

VAN, JAMES EDWARD, ED.D. *University of California, Berkeley*, 1982. 196pp.

Beginning with the twentieth century, the school and school district consolidation movement in the United States has resulted in ever larger schools. The movement was generated by an increasing number of school age pupils, growth of highly populated urban areas, educators' preoccupation with efficiency, and by those who argued that larger school units could enhance educational outcomes for students. In the 1970's student enrollment decline and restricted financing precipitated a new wave of school consolidations in a quest for greater efficiency and lower per pupil cost. The trend toward large schools continues in the absence of convincing evidence that the movement has achieved proposed objectives.

The study was designed to examine the relationship between school scale on the one hand and student academic achievement, student participation in school activities, vandalism and violence and student conformity to school rules on the other. In addition, the evidence gathered provided the framework within which a theoretical model linking school size and dependent variables was constructed. In sum, this study is designed to bridge the information gap between past studies and future research.

Qualitative and quantitative data, including grades in English, social studies and mathematics, interviews and a questionnaire administered to students, were gathered from two high schools. The two schools, one small (126 ADA) and one large (1926 ADA) were selected from among 92 schools in the San Francisco Bay Area because of extreme size differences, and similarities in student population and parent background factors. Chi-square values, frequency distribution, means, mode, standard error, standard deviation, median, and range of responses were calculated. Statistical analysis was accomplished by use of analysis of variance. Conventional level of significance (0.05 and 0.01) were used throughout this research analysis.

Analysis of the data generated several unexpected findings. First, no relationship between school size and academic achievement, student conformity to school rules and amount of violence and vandalism was observed. Second, Chi-square test and analysis of variance of CAP test data indicate that no relationship exists between school size and academic achievement of marginally academic students. Third, the data indicate that there is a negative relationship between school size and student participation in school activities. . . . (Author's abstract exceeds stipulated maximum length. Discontinued here with permission of author.) UMI

## ALGEBRA WORD PROBLEMS: EXPLORING HIGH SCHOOL STUDENTS' CONCEPTIONS THROUGH THEIR SOLUTION STRATEGIES

Order No. DA8313004

VASQUEZ, VICTOR MANUEL, PH.D. *University of California, Berkeley*.

1982. 184pp.

Algebra word problems are known to be difficult for high school students. Difficulties may be partially attributed to the idea they develop, through their classroom practice, about the purpose of the activity.

This study explores high school students' approach to the solution of algebra word problems.

Sixty-six students were individually given twelve problems to solve. Protocols of their solutions were collected using the "thinking aloud" technique.

Problems given to students were simple algebra word problems that required no specific formulas for their solution.

Analysis was focused on the strategies students used in their solutions. Results showed that, due to their classroom experience, students view "solving algebra word problems" as "setting up equations." Other strategies: "direct computation," "automatically answering," "trial and error" and "reinterpreting the problem," were only sporadically used. This was also true even in cases in which students had to restart a solution procedure several times due to difficulties.

Correlational analysis showed that successful students used equations in most of the problems and made little use of other strategies. Analysis also showed that less successful students tended to use alternate strategies more often, generally successfully.

Identifying and properly characterizing the unknowns was shown to be a crucial step in solving algebra word problems with equations. Solutions in which this step was properly carried out, significantly tended to succeed more often than those in which that step was haphazardly carried out or not performed at all.

Lack of a global qualitative understanding of the problem is viewed as a consequence of students' concentrated efforts to apply only equations. This lack was evident in two ways. First, in spite of numerous references to the problem statement, paraphrasing was very rare. Secondly, solutions without equations in which the problem had to be grasped as a whole, were very seldom produced.

To conclude this study, a model of algebra word problem solving is proposed. It contains a decision-making component that allows for the consideration of any strategy that can lead to successful problem solving.

### SEX-RELATED DIFFERENCES IN MATHEMATICALLY GIFTED SECONDARY STUDENTS: AN INVESTIGATION OF SELECTED COGNITIVE, AFFECTIVE, AND EDUCATIONAL FACTORS Order No. DA8228002

VERBEKE, KAREN ANN, PH.D. *University of Maryland*, 1982. 188pp.
Supervisor: Betty H. Simms

This study investigated sex-related differences in mathematically gifted secondary students. Research has shown that differences in mathematics emerge during the middle/junior high school years. Specific factors related to mathematics and indicators of sex-related differences were investigated. These included: spatial visualization skills, self-confidence, attitude toward success, usefulness of mathematics, stereotyping of mathematics as a male domain, number of mathematics courses taken and anticipated to be taken, and mathematics grade point average.

It was hypothesized that there would be a positive relationship between course-taking and each of the other factors and that there would be no significant differences between males and females for each of the factors. These hypotheses were tested using Pearson product-moment correlation coefficients and multiple regression techniques.

Ninety students (41 males and 49 females) in grades 8, 10, and 11, identified as being mathematically gifted (130 IQ score and 95th percentile in mathematics achievement test), from Carroll County, Maryland, participated in the study. The Space Relations Subtest of the Differential Aptitude Test, four of the Fennema-Sherman Mathematics Attitudes Scales, and a mathematics course-taking questionnaire were administered.

The results supported the researcher's hypotheses that a positive relationship existed between course-taking and spatial visualization skills and attitude toward the usefulness of mathematics. No significant differences were found between males and females in any of the factors except for the stereotyping of mathematics, with males demonstrating a more stereotyped attitude.

No sex-related differences were found in many of the areas where differences have been found in previous research. It was suggested by the results that mathematics course participation may be related to one's spatial visualization skills and attitude toward the usefulness of mathematics. There was no significant relationship between the other factors and course participation; however, because of the mathematical ability of the subjects in this study, these students may have more incentive to enroll in mathematics courses than their peers. A follow-up interview with 12 of the original subjects investigated attitudes affecting career choice, the decision to enroll in mathematics courses, and teaching-learning strategies.

### AN ANALYSIS OF THE RELATIONSHIPS AMONG ACADEMIC ACHIEVEMENT IN MATHEMATICS AND READING, ASSIGNED INSTRUCTIONAL SCHEDULES, AND THE LEARNING STYLE TIME PREFERENCES OF THIRD, FOURTH, FIFTH, AND SIXTH GRADE STUDENTS Order No. DA8322770

VIROSTKO, JOAN, ED.D. *St. John's University*, 1983. 147pp.

The purpose of this investigation was to examine the relationships among class instructional schedules, learning style Time preferences, and grade level, and their effect on the mathematics and reading achievement test scores of third, fourth, fifth, and sixth graders. Dunn, Dunn, and Price's concept of learning style was employed as the theoretical framework. Their instrument, the *Learning Style Inventory* (*LSI*) (1975, 1978, 1981) was utilized to establish the profile of individual preferences.

This research: (a) substantiated which of the 286 subjects were either matched or mismatched for Time preference and instructional schedule during each of two consecutive years of study; and (b) assessed whether individually or interactively, the three independent variables (Time preference, class instructional schedules for each of two years, and grade level) significantly affected the two dependent variables (NCE achievement test scores in mathematics and reading).

Data were analyzed using Three Way Analysis of Variance procedures with one repeated measure. For all data analyses procedures, hypotheses were tested at the .05 level of confidence.

Findings revealed that (a) youngsters whose Time preferences and class schedules were congruent, achieved significantly higher test scores; and (b) when Time preferences and class schedules were dissonant, lower scores were evidenced.

Thus, this investigation demonstrated that class instructional schedules coordinated with the individual Time preferences were the most significant factors responsible for increasing achievement test scores in both mathematics and reading at the .001 level of confidence.

### CORRELATES OF MATH ANXIETY IN FEMALE COLLEGE FRESHMEN STUDENTS: A PREDICTIVE STUDY Order No. DA8310437

WADDELL, LINDA HECHT, PH.D. *University of Missouri - Columbia*, 1982. 180pp. Supervisor: Robert Burton

The purpose of this study was to investigate the relationship of math anxiety to mathematics attitudes, math achievement, mathematics participation and parents' occupation and to ascertain which variables are most predictive of math anxiety.

Three hundred and forty female college freshmen students were given the Fennema-Sherman Mathematics Attitudes Inventory, including a math anxiety scale. A mathematics achievement test was also administered and students were asked to fill out a short questionnaire about their parents' occupation.

Data were analyzed using a stepwise multiple linear regression statistical procedure. Results of the regression analysis suggested four variables that are of greatest value in predicting math anxiety in the group of subjects studied Confidence in learning mathematics. Mathematics as a male domain. Teachers attitude toward mathematics and the Usefulness of mathematics. Findings of the study further suggested that individuals with a high level of math anxiety hold different attitudes toward mathematics and perform less well in mathematics than those who are not math anxious. In general, low math anxious subjects had lower scores on the mathematics attitude scales: the one exception was math as a male domain. These findings reflected low math anxious subjects' more positive attitudes toward mathematics. Furthermore, the data indicated that the professional or non-professional status or math-relatedness of parents' occupations had no significant correlation with the subjects' math anxiety. Results of analysis of the data indicated that as anxiety about mathematics increased, achievement in mathematics decreased for the population studied.

The results of this study warrant the following conclusions: (1) Math anxious female college freshmen have a relatively low level of confidence in their ability to study math effectively, see math as being less useful, are more negatively affected by their perceived teachers' attitudes toward mathematics and viewed mathematics as not necessarily a male domain. (2) If such a group of students were identified, they would be good subjects for inclusion in a program designed to reduce math anxiety so that they might have additional career options open to them.

## THE EFFECTS OF TEST ADMINISTRATION PROCEDURES ON STANDARDIZED DIAGNOSTIC MATHEMATICS TEST RESULTS

**Order No. DA8317146**

WALKER, ROBERT C., ED.D. *Lehigh University*, 1983. 180pp.

Despite the fact that achievement test constructors and users have long been aware of some of the potential sources of error in standardized tests, there has been relatively little systematic study of their effects. The purpose of this study was to determine whether the results of a standardized diagnostic mathematics test were affected by the manner in which the test was administered.

The subjects for this study consisted of students in grades five through eight from an open-space middle school located in a semi-rural/rural community. Each of the 822 subjects was randomly assigned per grade level to one of the four treatment groups tested: Direct-Small, Direct Large, Indirect-Small, or Indirect-Large.

For the purpose of this study two treatments were identified: direct (aloof, formal, mechanical) and indirect (warm, spontaneous, animated). The treatment groups were further divided into large and small testing groups with 76 and 28 subjects respectively. Despite the fact that two different treatments were used, all testing sessions were conducted according to the standardized testing procedures established by the test publishers. Furthermore, all testing sessions were conducted by the same examiner.

All subjects were tested with the Applications subtest of the *Stanford Diagnostic Mathematics Test* appropriate for their grade level. The Applications subtest was chosen because it tests the same three concept/skill domains at all grade levels.

The mean raw scores for the four treatment groups within each grade level were subjected to a three-way ANOVA with the type of test administration treatment, group size, and subject sex as the independent variables. Since each variable had two levels, a 2 x 2 x 2 design resulted.

The results of the ANOVA revealed a significant difference ($p < .05$) in the mean raw scores achieved by the direct and indirect treatment groups at the fifth and seventh grade levels. At both grade levels the difference in scores was in favor of the indirect treatment groups. The results further revealed a significant difference ($p < .01$) in the mean raw scores achieved by boys as compared to girls at the eighth grade level. The difference in scores was in favor of the boys. No significant two-way or three-way interactions of variables were found at any grade level.

## THE ORIGINS OF COUNTING IN CHILDREN

**Order No. DA8308503**

WALTERS, JOSEPH M., ED.D. *Harvard University*, 1982. 153pp.

Most children learn to count accurately with little systematic instruction. They use this skill to investigate the world of whole numbers and later in elementary school to solve problems of simple addition and subtraction. Furthermore, the counting procedure requires a complex coordination of gestures, recitation, and conceptual inferences. Nonetheless there are few detailed explanations of the origins of this remarkable skill, and even less empirical evidence to support these explanations.

The research presented in this thesis assumes that such a complex and nearly universal skill must be guided by an underlying cognitive scheme. One candidate for such as scheme is the "incremental skill," by which children compute the result of adding an additional member to a collection without necessarily recounting the collection. The hypothesis of this thesis states that this scheme appears quite early with small quantities and slowly becomes applicable to larger ones. It also guides the development of the counting process, which is itself a means for marking successive additions of a single unit rather than the one-for-one relationship between number words and gestures.

To test this hypothesis, 46 children between 4 years and 5 years 5 months were given a variety of tasks related to incrementing, counting, and number word recitation. Several repeated measure analyses including Guttman scales, Friedman nonparametric tests, and a factor analysis, revealed several predicted patterns.

The results showed that the incrementing skill appeared in children who could not count accurately, but the counting skill did not appear in children who could not increment. Secondly, the verbal skill with number words was related to the incrementing skill, but analysis of the pattern of scores for the two tasks suggested that the verbal ability was not sufficient as an explanation. Finally, two other tasks provided evidence that the incrementing skill involved more than the skill of number word recitation and could be used by children in unusual situations.

These results suggest that counting is not a sufficient explanation of the acquisition of early number concepts, and that in fact children have acquired some concepts that might not be expected at this age. The relationship between these findings and other major theories in the literature is discussed.

## THE RELATIONSHIP OF TESTOSTERONE CONCENTRATION, SPATIAL ABILITY, AND SEX ROLE IDENTIFICATION IN WOMEN TEACHING SECONDARY MATHEMATICS AND PRIMARY GRADES

**Order No. DA8229085**

WARE, DOROTHY LEE, ED.D. *University of Houston*, 1982. 101pp.

This study was designed to investigate the relationship between testosterone concentration, spatial ability, and levels of masculinity and femininity in women teaching secondary mathematics and primary grades. The study involved 51 women currently teaching in the Greater Houston area: 23 primary teachers (K - 3) and 28 secondary mathematics teachers.

Testosterone concentration was to be measured by the collection of saliva from each subject but problems with the validity of the data caused the variable testosterone concentration to be eliminated from the study. Spatial visualization was measured by the Punched Holes test from the Reference Kit of Cognitive Factors (Educational Testing Service) and spatial orientation was measured by the Group Embedded Figures test (Oltman, Raskin, & Witkin). Levels of masculinity and femininity were measured by the Personal Attributes Questionnaire (Spence, Helmrich, & Stapp, 1974).

The major findings of the study were as follows: (1) There were significant positive correlations between spatial visualization ($p < .0001$), spatial orientation ($p < .0001$), level of masculinity ($p < .01$) and teaching field choice among women teachers. (2) The set of variables, taken together (spatial visualization, spatial orientation, level of masculinity, and level of femininity) significantly discriminates between secondary mathematics teachers and primary teachers ($p < .0001$). Among women teachers, no significant correlation was found between level of femininity and teaching field choice. (3) Spatial visualization and spatial orientation, separately, were very significant discriminators between secondary mathematics teachers and primary teachers. (4) Levels of masculinity and femininity taken together significantly discriminated between secondary mathematics teachers and primary teachers ($p < .01$). These variables used in conjunction were better discriminators than either employed alone. (5) Applying the standardized canonical discriminant function for the set of variables (spatial visualization, spatial orientation, level of masculinity and level of femininity) to the actual group cases, the predictive percentage for the total group classification was 80.39%. This is in reality a somewhat inflated percentage as the predictive equation was derived from the same data.

### AN ANALYSIS OF TEACHER AND SCHOOL FACTORS INFLUENCING COMPUTATIONAL SKILLS ACHIEVEMENT IN EIGHTH GRADE MATHEMATICS IN ARKANSAS SCHOOLS

**Order No. DA8322874**

**WATSON, CHARLES DANIEL, ED.D.** *University of Arkansas*, 1983. 133pp. Major Professor: Jay Graening

*Purpose of the Study*. The purpose of this study was to test an array of alterable teacher and school variables that were hypothesized to contribute to observed variance of student achievement of computation skills in eighth grade mathematics.

*Hypotheses*. Four hypotheses were examined concerning student achievement of computation skills. Two hypotheses assumed that there was no significant difference in student achievement among three unique geographic regions within the state and that there was no difference attributable to school district size. The other hypotheses dealt with the evaluation of seven alterable variables to determine the extent to which each contributed to the observed variation.

The alterable factors studied were type of certificate held by the teacher, sex of the teacher, annual salary of the teacher, years of experience of the teacher, average class size, basal adopted textbook and school accreditation status.

*Procedures and Statistical Techniques*. A stratified random sample of thirty-six Arkansas school districts composed the sample. The districts were stratified by size of school district and geographic region of the state. The measure of student achievement was the computation sub-test of the Science Research Associates Achievement Test Series.

The analysis of variance statistical technique was used to identify factors that contributed significantly to the observed variance in student achievement. The Duncan Multiple Range Test was used to determine the source of the variation within those factors that were shown to be statistically significant.

*Conclusions*. The following major conclusions were reached by the study: (1) Students in small school districts (fewer than 500 average daily membership) scored lower than did students in larger size school districts. (2) Students in classes taught by teachers certified in Secondary/Middle School Mathematics tended to score higher than students in classes taught by elementary certified teachers. (3) Students in schools accredited by the North Central Association scored at a higher level than did students in schools not accredited by the NCA. (4) Although not statistically significant in every case, class size (fewer than 21 students) was associated with higher achievement.

### INDIVIDUALIZED MATHEMATICS INSTRUCTION IN AN AUSTRALIAN UNIVERSITY

**Order No. DA8229205**

**WATSON, JANE MARIE, PH.D.** *Kansas State University*, 1982. 246pp.

The primary purpose of this investigation was the comparison of two instructional and assessment methods used in teaching mathematics in an Australian university. The experimental method involved an individualized system of instruction and considerable choice in form of assessment. The control method was a traditional lecture course with one end-of-course examination for assessment. Of secondary interest were characteristics associated with the choice of assessment option within the experimental group.

*Procedures*. The sample was composed of students enrolled in the mathematics course, Discrete Modelling I, at the University of Tasmania, from 1978 to 1980. Because of the use of intact groups, fifteen independent variables were used in an analysis of covariance model for studying dependent variables related to attitude and long term retention. The withdrawal and pass rates were compared using difference in proportions. T-tests were used to compare test-taking versus non-test-taking assessment options for the experimental group on characteristics possibly associated with test-taking.

*Results*. The results indicated that a better attitude toward the handling of the course and a higher pass rate occurred for the experimental group, while the control group had better long term retention of concepts. There was no difference between the two groups in withdrawal rate or in attitudes toward the content material or the instructor. Within the experimental group those who chose an assessment option involving test-taking scored higher on enjoyment of mathematics and self-concept of mathematical ability. They did not exhibit a significant difference in test anxiety.

*Conclusions*. The mixed results obtained make an overall conclusion favoring one treatment difficult. The more positive attitude to the handling of the course and higher pass rate for individualized instruction support findings of other studies. It would appear that the students gaining most under the experimental treatment were those who would have received terminating passes in the control group. The result favoring long term retention for the control group does not support findings in other subject areas (no other studies in mathematics were found). It was concluded that the review for the end-of-course examination in the control group aided in long term retention.

### A LONGITUDINAL STUDY OF THE EFFECTS OF THE WADSWORTH CITY SCHOOLS PRESCHOOL PROGRAM

**Order No. DA8300004**

**WEBB, JOE SUTTON, III, PH.D.** *The University of Akron*, 1983. 125pp.

The major purpose of this study was to examine the longitudinal effects of the Wadsworth City Schools Preschool Program by comparing the scholastic achievement of children with preschool experience and those without this experience who were currently enrolled in kindergarten through sixth grade in the Wadsworth City Schools. Another purpose of the study was to determine whether or not a statistically significant relationship exists between students attending preschool and standby students not attending preschool with regards to IQ scores at the third-grade and fifth-grade levels. The study also sought to determine differences in numbers of preschool students and standby students being retained and placed in special education.

The ex post facto research design was implemented for the study. A group of kindergarten through sixth-grade students was selected from five elementary schools and one middle school in Wadsworth City Schools, Wadsworth, Ohio. These students were currently enrolled in Wadsworth City Schools from 1975 to 1981. The preschool group was identified by having low readiness skill test scores. However, due to limited class size not all of the identified subjects attended preschool. Therefore, the remainder of the subjects who qualified for preschool, but did not attend, were placed in a rank order by scores. This group of children was called the standby group.

The t test and other descriptive statistics were used to analyze the tabulated data. The means, standard deviations, separate variance formula, and probability levels were computed for all statistical hypotheses at the .05 level.

Results showed that the standby group (4-year-old preschool students who did not attend school) performed significantly higher in all areas tested except fifth-grade math. However, the reader must be cautioned in interpreting these results because the two groups were not initially equal. The standby group scored higher on school readiness skills (as compared to the preschool group), therefore, qualifying them as a standby group.

It was recommended that further research be conducted using a longitudinal design to gain information beyond the sixth-grade level.

### THE RELATIONSHIP OF TEENAGE AND LATE CHILDBEARING MOTHERHOOD TO SUBSEQUENT IQ, EDUCATIONAL ACHIEVEMENT, AND ADJUSTMENT OF OFFSPRING

**Order No. DA8303886**

**WEEKS, ZONA ROBERTA, PH.D.** *Indiana University*, 1982. 91pp. Chairperson and Director: Dr. Gary Michael Ingersoll

Data from the Cycle II portion of the Health Examination Survey conducted by the National Center for Health Statistics from 1963 to 1965 were used to compare children born to teenage mothers with children born to mothers thirty-five years of age or older in subsequent intelligence, educational achievement, and school adjustment.

The data were analyzed by three methods: (1) a t-test was used to compare the means of the two groups of children on measures of IQ (Wechsler Intelligence Scale for Children Vocabulary and Block Design subtests), and achievement in reading and arithmetic (Wide Range Achievement Test Reading and Arithmetic subtests); (2) analysis of covariance was used to compare the achievement and mean intelligence scores of children in the two maternal age groups and racial groups when controlling for the effect of mothers' education; (3) behavioral-social questionnaire items as a measure of school adjustment were analyzed through the use of chi-square procedures involving crossclassification of children based on the two levels of maternal age and other categorical variables.

Findings indicated that children of older mothers, as a group, and without considering mothers' education, scored significantly higher than young mothers' children on measures of IQ and reading and arithmetic achievement. When mothers' education was controlled, differences were diminished. Racial differences were observed, despite controlling for mothers' education. White children received higher mean intelligence scores than Black children in both maternal age groups.

Ratings by school personnel of behavioral-social questionnaire items resulted in only a few findings of significant differences between the two groups. A higher proportion of older mothers' children were rated more attentive, but differences in restlessness were non-significant. More children of young mothers were frequently accused of fighting, but differences were non-significant on ratings of roughness and discipline required for aggressive behavior. Raters were more likely to judge children of mothers thirty-five years of age and older as higher in intellectual and academic ability.

Differences on the behavioral-social ratings were insufficient to determine any particular overall behavioral trends differentiating the two groups of children.

## A COMPARISON OF THE INTELLECTUAL, ACADEMIC, AND PERSONALITY FUNCTIONING OF PRIMARY GRADE CHILDREN BORN WITH THREE DIFFERENT TYPES OF OBSTETRICAL ASSISTANCE

Order No. DA8310886

**WEILER, MARC EDMOND**, PH.D. *Hofstra University*, 1982. 164pp.

The suggestion has been made that an association exists between the use of obstetrical instrumentation and later developmental impairment in children. Currently, two techniques are available to assist in delivery for the same medical implications, i.e., vacuum extraction and forceps assistance.

This research compared children born with either of these types of assistance to children born without instrumentation, on objective measures of intellectual, academic, neurological, and personality functioning, in a retrospective follow-up design which matched for sex, race, birthweight, and gestational age, and controlled for socioeconomic status.

Seventy-eight children, born between January 1974 and August 1977 at Nassau County Medical Center, East Meadow, N.Y., were evaluated with Wechsler Intelligence Scale for Children-Revised or Wechsler Preschool and Primary Scale of Intelligence, Wide Range Achievement Test, Quick Neurological Screening Test, Beery-Buktenica, and pediatric neurological examinations. Parents completed socioeconomic status and educational interviews and the Personality Inventory for Children.

Data treated by analyses of variance and covariance, chi-square and correlational techniques, and discriminant analysis substantiated the following hypotheses: (1) no differences in infant viability following birth between vacuum extraction and forceps conditions; (2) a positive correlation between socioeconomic status and intellectual functioning and reading ability; (3) no relationship between infant viability and later developmental functioning; and (4) the Quick Neurological Screening Test correlates with pediatric neurological examination results.

Data indicated no substantiation for hypotheses predicting: (1) the superiority of noninstrumentation conditions on any of the dependent measures, or on (2) measures of infant viability; (3) significant correlations between socioeconomic status and visual motor perceptual, mathematics, or neurological functioning; and (4) greater use of remedial and mental health services by instrumentally assisted children.

Socioeconomic status, mother's age at birth, verbal IQ, and reading skill, in order of their importance, contributed to a factor discriminating between instrumentation groups. The two dependent variables contributed 8.2% of a total 27.7% variance.

Forceps and vacuum extraction appear clinically equal alternatives, in terms of association with later psychological development, when indications are for low forceps delivery. These instrumentally assisted children appear at no greater risk for later developmental impairment than children born without instrumentation.

## AN EXPERIMENTAL INVESTIGATION OF THE INTERACTION BETWEEN SENSORY MODALITY PREFERENCE AND MODE OF PRESENTATION IN THE INSTRUCTION OF ARITHMETIC CONCEPTS TO THIRD GRADE UNDERACHIEVERS

Order No. DA8322771

**WEINBERG, FREDERICK HUNTER**, PH.D. *St. John's University*, 1983. 228pp.

The hypotheses presented in this experiment were based on three tenets taken from learning style theory: (a) when modality preference was not considered no one best method of arithmetic instruction would exist for all students; (b) individuals with multi-sensory deficits would be at a greater disadvantage when learning arithmetic material when contrasted with learners with a unitary sensory deficit and a corresponding strength, and (c) there would be a significant positive interaction between mode of presentation and modality preference.

*Results.* Hypothesis I maintained that there would be no one best teaching method for all students. The results of an Analysis of Variance testing the differences in change scores among groups taught by auditory, visual or nonpreferenced teaching methods revealed an insignificant F ratio, providing support for Hypothesis I.

The achievement of nonpreferenced learners was predicted by Hypothesis 2. The results of an Analysis of Variance yielded a non significant F ratio indicating no difference in post experimental achievement among modality preferenced groups. Hypothesis 2 thus was not supported.

The data indicated that visual preferenced learners demonstrated statistically higher improvement when instructed through the visual, rather than auditory, condition. The data also revealed higher change scores for the visual preferenced condition when contrast with those of the tactile/kinesthetically enriched condition. No statistical support was assessed for the greater effectiveness of an auditory preferenced/auditory enriched modality match. Mixed support was revealed for the pairing of the nonpreferenced learners with the tactile/kinesthetic condition. Those students demonstrated significantly higher mean change scores through a tactile/kinesthetically enriched approach rather than through a visual one. They also performed better through the tactile/kinesthetic, rather than auditory, approach although those differences were not statistically significant. No difference in the effectiveness of the tactile/kinesthetically enriched condition was revealed statistically.

The findings were viewed as having implications for the discontinuation of the commonality system. Additionally, the possibly deterimental effects of continuing instruction in a lecture discussion method for youngsters with auditory deficits was described.

## SCHOOL MATHEMATICS LESSONS AS A COLLABORATIVE EFFORT BETWEEN TEACHER AND STUDENTS IN TWO NINTH GRADE MATHEMATICS CLASSES - GENERAL MATH AND ALGEBRA

Order No. DA8303872

**WEISBECK, CHRISANNE**, PH.D. *Michigan State University*, 1982. 257pp.

Concern about the degree of mathematical illiteracy present in the American population prompted this study. General math is the last math class taken by half of the ninth graders in the United States. Their mathematics education stops at general math.

The purpose of this study was to describe and compare a ninth grade general math class and a ninth grade algebra class taught by the same teacher. Algebra is the first class in a sequence for college bound students. The two classes were observed for one school year and the data base for the study consisted of 62 sets of field notes, 31 for each class. A method of analysis was developed for the study which used the mathematics content of the lessons as the basis for studying the teacher/student communication during the class. The teacher's logical presentation of content for each lesson was stated in a sequence of steps. These steps structured the lesson and provided a framework for examining the social interaction which occurred around the content. A coding system was devised for the study to analyze the teacher/student interaction during the mathematics lesson.

The findings revealed that mathematics lessons are a collaborative effort between teacher and students. The teacher prepares and presents the content and the students respond to teacher and content. They jointly produce the mathematics experience. During this process content and social organization are mutually influenced by the progress of the collaboration. The algebra class involved more communication by the teacher than the students. The algebra students were cooperative with the teacher in the joint production of the lesson and more content was presented in the lessons. The general math class involved almost the same amount of communication by the teacher and the students. The general math students were adversaries to the teacher in the joint production of lessons and the content presented was simplified and familiar.

The analysis of collaboration in these two classes illuminated some issues regarding what makes general math harder to teach than algebra. This analysis of collaboration also provided a new focus for research in classroom analysis with the subject matter content as a basis for examining the classroom social organization.

## THE EFFECTS OF EARLY INTERVENTION ON THE LEARNING RATES OF LEARNING DISABLED STUDENTS IN THE BASIC SKILL AREAS OF READING AND MATHEMATICS: A LONGITUDINAL STUDY

Order No. DA8312292

Welch, Carmon Whitis, Ed.D. *Texas Woman's University*, 1982. 331pp.

The purpose of the study was to analyze longitudinal data which has been collected over a period of 7 years on learning disabled (LD) students in a cooperative district comprehensive special education program to determine (a) whether or not significant differences in the learning rates of LD students, in reading and mathematics, existed in systematic trends across time; (b) whether or not those differences could be attributed to the ages or grade levels when the students received intervention services; and (c) whether or not the results of the statistical analyses support the notion of early intervention programs to enhance the learning rates of LD students in the basic skills areas of reading and mathematics.

The longitudinal data consisted of pretest and posttest ratings on 257 LD subjects collected with the *Wide Range Achievement Test* (WRAT) which was administered on an annual basis as part of a battery of assessment instruments administered by 2 diagnosticians.

Analysis procedures consisted of (a) a one-factor analysis of variance (ANOVA) on total and average gain to remove any systematic influences of the covariate factors on gain to allow for inspection of differences between intervention levels free of covariate influences (age, sex, ethnic origin, degree of handicap, grade, school districts, IQ, attrition status, and intervention level); and (b) a two-factor repeated-measures analysis of covariance (ANCOVA) on total and average gain to allow for inspection of trends across time and the differences on such trends due to intervention levels. The pretests were always used as the covariate, and when two or more testing measures were dependent variables, they consisted of a repeated factor.

Results of the statistical analyses revealed that (a) significant differences in learning rates of LD subjects exist in systematic trends across time, (b) the significant differences can be attributed to intervention levels; and (c) the notion of early intervention for young LD children is supported by the results of the analyses in reading but not in mathematics.

## THE EFFECTS OF INTERCLASSROOM ABILITY GROUPING ON THE SELF-CONCEPTS OF FOURTH GRADE STUDENTS

Order No. DA8317991

Werling, Richard A., Ed.D. *University of Kansas*, 1983. 138pp.

Fourth grade students in six classrooms in a small school district in southeastern Kansas were being taught reading, language arts, and mathematics in high, average, and low interclassroom ability groups. A review of the literature showed that research had produced mixed results in determining the effects of ability grouping on the self-concepts of students. This study was conducted to determine if interclassroom ability grouping for reading instruction, as practiced in this school district, had any effect on the self-concepts of students. Also researched was the effect on the self-concepts of those students who were placed in one, in two, or in three low ability groups. In all cases, differences in the effect on each sex were also examined.

The *Piers-Harris Children's Self Concept Scale* was administered to the students at the very beginning of the school year just before interclassroom ability grouping was initiated and again at the end of the school year. A series of t tests was used to compare means of the pretests and posttests. A one-way analysis of variance and the Mann-Whitney test were used to determine if there were different effects on the self-concept depending upon the number of low ability groups in which a student was a member.

Results of the hypothesis testing showed no significant differences in the self-concepts of students who were placed in either high, average, or low interclassroom ability groups for reading instruction. Significant differences in effect on the self-concept for boys versus girls in each ability level also were not found. In addition, no significant differences in the effect on the self-concept were found for those students placed in one, in two, or in three low ability groups. This was also true for boys versus girls in these three categories.

Possible reasons for these results are that ability grouping was used only for instruction in these three subject areas, and a student was not necessarily in the same ability level for each subject area. Also, students were moved from one group level to another whenever achievement warranted it. This was to insure that students met with success in their school work.

## RETENTION VS. ASSIGNMENT: IMMEDIATE AND LONGITUDINAL EFFECTS ON STUDENT PERFORMANCE

Order No. DA8322850

Whitney, Dixie Lynn, Ph.D. *Indiana State University*, 1983. 109pp. Director: Dr. James Higgins, and Co-Chairpersons: Dr. Marvin Henry, Dr. James Tyson

*Problem*. The immediate and longitudinal effects of retention and assignment on reading and mathematics achievement and IQ scores have not been fully researched. Specifically, this study examined the problem by attempting to answer the following questions: (1) Is there an immediate effect on retention and/or assignment on reading comprehension? (2) Is there a longitudinal effect of retention and/or assignment on mathematics achievement? (3) Is there a longitudinal effect of retention and/or assignment on those qualities measured by IQ tests? (4) Is there an empirical base to support the practices of retention and/or assignment in the schools?

*Method*. Subjects used in this study were the 93 retained and 33 assigned students from a rural middle school from West Terre Haute, Indiana. The data were obtained from the students' standardized achievement test scores and aptitude test scores as recorded in the cumulative folders. The grade equivalent scores on the reading comprehension and mathematics composite subtests were recorded along with all available intelligence test data. Sex, years of retention/assignment, number of times retained/assigned, and specific grade level test data were collected on the instrument. The statistical analysis included a two-tailed, correlated t-test of significance for analyzing data within groups and a two-tailed, independent sample t-test of significance was utilized for comparison of the two groups (retained and assigned).

*Conclusions.* (1) The practice of retention did produce a statistically significant positive effect on reading comprehension during the retention year (although reading scores were well below the norm); however, the longitudinal effect of retention showed no significant differences on reading achievement. (2) There was an immediate positive effect of assignment on reading achievement, but the longitudinal effect, again, was of no significance. (3) There was an immediate effect of assignment on the mathematics achievement, but no longitudinal effects of retention or assignment on math scores existed. (4) The IQ scores of retained students failed to grow at an expected level and reflected a negative effect on the IQ scores of the retained subjects. (5) The IQ scores of the assigned group also dropped, but the difference was not found to be statistically significant. (6) There was no body of reliable research to support the practice of retention/assignment as the sole basis for improving test scores and achievement in reading and mathematics.

## THE TRANSFER OF INSTRUCTION IN ARITHMETIC PROBLEM SOLVING Order No. DA8310945

**Wilcox, Dee Ann, Ph.D.** *Washington University*, 1982. 123pp. Chairman: Dr. Bryce B. Hudgins

This study was designed to link training in arithmetic problem solving and its transfer to new problems. Transfer was defined as solving types of problems which were new to the learners and which differed from those with which they were trained. These types of new problems varied along a continuum of "remoteness" which related to the degree of difference between these new "transfer" test problems and the training problems.

Four methods of training in word problem solving were used (looking for "cue words" in the problem, writing equations to represent the problem, writing "what is given" in the problem and "what the problem asks you to find", and drawing a picture to represent the problem) and the hypothesis tested was that the treatments, in the order listed above, would transfer progressively more remotely. The Information Processing model and its concept of "connectedness" was present as the theoretical model of transfer.

Ninety-one fourth grade students were pretested with a test which contained all types of word problems. They were then assigned randomly to four matched groups and each group was assigned one of the training conditions. Students were trained in one individual session followed by worksheets for up to six days. When a student met an 80% mastery criterion on two consecutive days' worksheets he was posttested with a form parallel to the pretest as well as with an additional set of "remote" problems from subject areas other than arithmetic. Students who did not meet the mastery criterion were posttested on the seventh day.

It was found that the four treatments did not differ significantly in their ability to foster transfer. However, both the mean posttest scores of those students who did and those who did not meet the mastery criterion were higher than the mean pretest scores. Therefore, it was argued in the paper that, while the experimental treatments did not differ in their ability to transfer, the exposure of the learners to this work did facilitate their overall word problem solving ability.

## RELATIONSHIP BETWEEN LEVELS OF VOLUNTARY CHOICE OF SCHOOLS, SCHOOL ACHIEVEMENT AND ATTITUDE TOWARDS SCHOOL Order No. DA8320301

**Williams, Henry Preston, Ed.D.** *State University of New York at Buffalo*, 1983. 140pp.

The purpose of this study was to examine the relationship between the levels of student participation in the school choice process, academic achievement, and attitude toward school. The principal independent variable of choice was analyzed to determine the relationship between the dependent variables of academic achievement and the variable of attitude toward school.

The dependent variable of achievement was comprised of six measures: Metropolitan Achievement Test results from Spring 1982 in reading and mathematics, report card grades in mathematics, English, science, and social studies. The dependent variable of attitude toward school was comprised of seven measures: a Survey of School Attitude instrument which measured the attitudes that students had toward mathematics, English, science, and social studies. The study examined the covariables of fifth grade Metropolitan scores in mathematics and reading, elementary discipline problems, grade, sex, and ethnic background, to ascertain their effects on the relationship among choice, achievement, and attitude towards school.

The investigation took place at the Joseph C. Wilson Magnet High School in Rochester, New York. Three hundred students were subdivided into three groups, parent, joint, and student. These groups were formed to determine which of the choice or choice groups, if any, achieved higher academically and exhibited the more positive attitudes towards school as a result of involvement in the school choice process.

To determine if various levels of participation in the school choice process impacted academic achievement and attitude towards school, the multiple regression approach to covariance analysis was performed on six achievement measures and seven measures of attitude toward school. Of the six measures which comprised the achievement variables, none was found to be statistically significant. Of the seven measures which comprised attitude, only House Administrator discipline referrals was statistically significant.

*Conclusions.* Several conclusions were reached that may have accounted for the lack of significant finding. (1) Time, perhaps one year after the choice is not sufficient elapsed time to judge academic gains and resultant attitude changes. (2) Participation or the lack of participation is not an indicator that achievement will be either higher or lower and/or that attitudes towards school will be negative or positive.

## A CURRICULUM MODEL FOR COMPUTER LITERACY FOR ELEMENTARY SCHOOL TEACHERS Order No. DA8322612

**Williams, Kathryn Virginia, Ed.D.** *University of the Pacific*, 1983. 191pp. Chair: Dr. Estelle Lau

The purpose of this study was to provide a model for computer literacy curriculum for elementary school teachers. The educational philosophy which guided the development of the curriculum was that of John Dewey.

Subjects in the study were 149 elementary school teachers in Stockton Unified School District. Data were collected using a survey developed by the researcher of the study. The following categories of information were obtained: Years of teaching experience; level of mathematics training, previous computer training and experience; attitudes toward computers and their use in education; commitment to learning about computers; and perceived importance of potential computer literacy topics.

These hypotheses were tested with Spearman's rho: (1) number of college mathematics courses taken is correlated with attitude toward computers and (2) years of teaching is correlated with attitude toward computers. Statistical analysis revealed a significant positive correlation between attitude toward computers and number of college mathematics courses taken, and a significant negative correlation between attitude toward computers and number of years of teaching. The more mathematics classes taken in college, the more positive was the attitude toward computers. The more years the individual had taught, the less positive was the attitude toward computers.

These hypotheses were tested with multiple regression: (1) attitude toward computers is correlated with computer literacy topics perceived to be important and (2) commitment to learning about computers is correlated with computer literacy topics perceived to be important. Statistical analysis indicated teachers with the most positive attitudes toward computers and the strongest commitment to learning about computers believed the most important computer literacy topics were those focusing on operating and programming computers.

The results of the data analysis and the philosophy of John Dewey served to guide the preparation of an introductory computer literacy curriculum for elementary teachers. It was composed of six separate lessons, and required the use of a microcomputer. The aims of the curriculum were to (1) learn to operate a simple computer, (2) understand the steps of a simple program and explain what a simple program does, (3) find errors in simple programs, (4) make modifications in simple programs, and (5) write simple programs to solve a single problem and to solve several similar problems.

## THE USE OF IMAGERY AS A MNEMONIC TO TEACH BASIC MULTIPLICATION FACTS TO STUDENTS WITH LEARNING DISABILITIES Order No. DA8226953

WILLOTT, PATRICIA CHRISTINA, ED.D. *West Virginia University*, 1982. 85pp.

The intent of this study was to teach learning disabled students to use imagery as a mnemonic in order to improve their recall of basic multiplication facts. The mnemonic relied on the use of "peg words" that rhymed with each numeral. At the beginning of the investigation none of the students, from grades four through six, could recall any of the 12 facts used in the study.

Each fact was prepared on 35 mm slides in four different ways, so that the factors (e.g. 6 x 9) and/or the product (54) were either abstract or concrete. The factors or products were considered abstract when they appeared as numerals and concrete when they were represented by pictures of the appropriate peg words. For example, in the concrete--abstract condition the fact 6 x 9 = 54 was depicted as "sticks times line is 54." The four different conditions were: (1) abstract--abstract (A-A), (2) concrete--abstract (C-A), (3) abstract--concrete (A-C), and (4) concrete--concrete (C-C).

Fifteen learning disabled students were trained and tested individually during two separate sessions. Six of the facts were presented during the first session in the A-A condition. All six facts were shown, in random order, on each of four consecutive trials. Oral and written post tests were administered after each trial. Subjects were then taught the peg words that rhymed with the numerals in the six remaining facts. These facts were presented during session two in the imagery conditions, two in the C-A condition, two in the A-C and two in the C-C condition.

Sign test comparisons indicated that significantly more correct responses were recorded for facts presented in the C-C condition when compared to the A-A and C-A conditions. The A-C condition was also more effective than the A-A condition when just the oral responses were compared.

These results indicated that under certain conditions it is possible to improve the recall of multiplication facts, by learning disabled students, with the use of imagery as a mnemonic.

## A SURVEY OF THE CONDITIONS SURROUNDING THE INTRODUCTION AND FIRST-YEAR UTILIZATION OF MICROCOMPUTERS IN FOURTEEN SELECTED ELEMENTARY SCHOOLS OF EDMONTON, ALBERTA, CANADA Order No. DA8308415

WILLSON, KATHERINE JOAN, PH.D. *University of Oregon*, 1982. 108pp. Adviser: C. W. Schminke

The purposes of this study were to determine (a) factors influencing the purchase of a microcomputer, (b) uses of the microcomputer during school year, (c) observable relationships between teachers' computer-related experience and use of the microcomputer, (d) whether use of the microcomputer increases level of teacher computer knowledge, and (e) any observable changes in teacher attitude throughout the year.

Initially 136 principals were surveyed to determine schools planning to purchase a microcomputer for the 1981-82 school year. Fourteen elementary schools were identified from which 168 teachers and administrators composed the final focus of the study.

An instrument entitled "Information Inventory" was administered in September 1981 to assess subjects' attitudes, general computer knowledge, and prior computer-related experiences. It also provided information regarding evidence of planning. This inventory was readministered in May 1982.

The study revealed principal motivation for microcomputer selection to be "administrative initiative." Fewer than one-fourth of the schools reported the existence of prior plans before arrival of the microcomputer.

The majority of teachers utilized the microcomputer with commercial programs to reinforce basic skills. Mathematics was the most frequently used software.

Use with the entire class was the most common classroom organization (79 percent) with 30 percent grouping for enrichment. Over half the subjects (60 percent) had access to a microcomputer for an hour or less per week. Location of the microcomputer varied according to school. The most popular location was the users' own classroom.

A relationship was evident between subjects' computer-related experience and computer use. Generally greater exposure to computers resulted in an increased diversity of usage.

Although the user group showed a mean score increase in computer knowledge, so did the nonuser group. It is therefore difficult to attribute the users' increased score solely to the use of the microcomputer.

The presence of a single microcomputer in a school did little to change teacher attitudes throughout the year.

## THE DESIGN, ADMINISTRATION, AND ANALYSIS OF AN INSTRUMENT WHICH IDENTIFIES MATHEMATICALLY GIFTED STUDENTS IN GRADES FOUR, FIVE AND SIX Order No. DA8324673

WILMOT, BARBARA ANNE, PH.D. *University of Illinois at Urbana-Champaign*, 1983. 129pp. Adviser: Dr. Harold H. Lerch

The purpose of this research has been to devise, administer, and analyze an instrument which could aid school personnel in the process of identifying their mathematically gifted students.

Because both the construct of giftedness and the field of mathematics are complex and diversified, the identification of those with high mathematics ability is very difficult. Four types of thinking strategies common to those with high mathematical abilities are: (1) quantitative, (2) perception of patterns, structures, and relationships, (3) inductive reasoning and generalization, and (4) deductive and analytic reasoning.

Items attempting to measure these four types of thinking strategies were designed, tested in informal situations, and revised. A preliminary instrument was pilot-tested, revised, re-tested, and revised again. The inventory was validated by a panel of experts.

During April and May, 1982, the *Mathematical Thinking Strategies Inventory* (MTSI) was administered to 1134 students in grades four, five, and six from five central Illinois school districts. The data included their scores and other information such as grade level, sex, feelings about math, achievement test scores, and previous identification of mathematical giftedness.

Findings include: (1) the raw scores on the MTSI for each grade level and for the entire group approached a normal distribution, (2) the instrument (MTSI) is internally reliable, (3) four distinct constructs were being tested by the MTSI, (4) item difficulty levels for each item on the MTSI were established, (5) the mean of the scores on the MTSI for each grade level was significantly higher than the mean for the grade level(s) below it, (6) there was no significant difference between the performance of girls and boys on the MTSI, (7) there is not a strong relationship between the scores on the MTSI and the scores on the mathematics components of a standardized achievement test, (8) there is a very weak relationship between the feelings of these students towards math and their performance on the MTSI and (9) the MTSI identified as gifted some students who were already recognized as gifted, and some who had not been identified. There were other students who had been identified as gifted who did not score in the upper range of this test.

## AN INTERVENTION PROGRAM USING ALTERABLE VARIABLES TO IMPROVE SCHOOL SUCCESS OF UNDERACHIEVERS Order No. DA8300188

WILSON, BILLY TRAVIS, ED.D. *Oklahoma State University*, 1982. 59pp.

*Scope and Method of Study.* This study was directed at investigating the effects a school counselor had on altering variables by training parents to increase their underachieving child's school success. Parent volunteers of eight children comprised the treatment group and their eight children comprised the treatment group and their eight children were subjects for the study. As an initial step in the procedure all of the Beaver Public School students, grades two through eight, were screened using the *Gates-MacGinitie Reading Test*, the *Metropolitan Achievement Test* (math section), and the *Peabody Picture Vocabulary Test*. The underachieving student was identified as having average intelligence but achieved below the 40%ile on either the *Gates-MacGinitie Reading Test* or the *Metropolitan Achievement Test*. Random assignment led to the formation of two equal sized student groups, one of which was referred to as the experimental group. Their parents received six training sessions on the alterable variables. The other group was referred to as the control group. Their parents received no training sessions. The treatment included the alterable variables of family self-esteem, parent encouragement, parent aspirations, home study help, and home time and space organization. After treatment, the *Self Observation Scale* (SOS) and the *Self Concept Adjective Checklist* (SCAC) were administered. School absences and grade point average were monitored until the end of school (five months later) at which time the second SOS and SCAC were administered.

*Findings and Conclusions*. Utilizing Post-delayed Post analysis of variance technique to measure the treatment effect of the parent sessions over time and using a One-Way ANOVA to compute the analysis of variance on absences and grade point average, specific conclusions were drawn. The grade point average experienced a significant difference between the experimental and control groups. The statistical analysis also indicated no significant differences between the experimental and control groups on the remaining dependent variables. Thus, according to the findings of this study, the six parent sessions that were used to affect the underachieving child's alterable variables did have a positive effect on their school success.

## ANALYSIS OF SELECTED MEASURES AS PREDICTORS OF STUDENT PERFORMANCE ON THE VIRGINIA MINIMUM COMPETENCY TEST

Order No. DA8307900

WILSON, JAMES HENRY, ED.D. *The George Washington University*, 1983. 314pp. Chairperson: Frederick James Brown, Jr.

The purpose of this study was to examine and determine which measures, if any, could be used in the Alexandria City, Virginia, school district to profile students' probability of attaining or not attaining the necessary life coping skills defined and measured by the Virginia Minimum Competency Test (VMCT).

Scores from two groups (students who passed the VMCT and students who failed the VMCT) were analyzed to determine the relationships among the students' absentee rate, grade point average, placement in English, level of mathematics, parents' income levels, number of parents in household, amount of home support received, race, sex, SRA score, Stanford Achievement Test score, and the Short Test of Education Abilities (STEA) score.

An extensive review of the literature was conducted, and numerous measures were identified to reflect a desirable profile of students' probability of attaining or not attaining the necessary life coping skills defined and measured by the VMCT.

The Pupil Perception Questionnaire was administered to 150 10th, 11th, and 12th graders (75 who had passed and 75 who had failed the VMCT). A group of three parents, three students, a guidance counselor, two assistant principals, and a principal devised the home-support instrument after compiling the responses from the questionnaire. A subsequent pilot study was conducted involving volunteers from a similar group. The pilot group submitted input before the home-support instrument was finalized.

Relative data were collected from the students' cumulative folders for the final study.

The data were examined by using the chi-square and the Pearson product-moment correlation coefficients to analyze the hypotheses and the relationships of the measures. In addition, two multiple-regression analysis functions and scattergrams enhanced the data analyses.

The 14 null hypotheses were rejected (oc = .05), and therefore, sufficient data were available to make a statistical decision to accept all 14 of the research hypotheses.

## FREQUENCY OF FEATURES OF IRRELEVANT DIMENSIONS IN A GEOMETRIC FEATURE IDENTIFICATION TASK

Order No. DA8305412

WILSON, PATRICIA SIMMONS, PH.D. *The Ohio State University*, 1982. 120pp. Adviser: Professor Richard J. Shumway

Psychological research favors sequences of all positive instances over sequences of mixed positive and negative instances in a conjunctive feature identification task. Educational research favors the use of mixed sequences over sequences of all positive instances.

Junior high school algebra students were given instruction on using negative instances in a conjunctive letter string task. They were given sequences of instances and asked to identify the critical features of the geometric concept, altitude of a triangle. Most students were able to use negative instances and to identify the two critical features of the geometric concept.

The two sequence conditions ( + and ±) were crossed with the two frequency conditions (1:1 and 9:1) to form four treatment groups. The sequences consisted of either all positive instances ( + ) or alternating positive and negative instances (±). The features in the irrelevant dimensions were either balanced so that each occurred about 50% of the time (1:1) or they were weighted so that one feature occurred about 90% of the time (9:1). There was significant interaction between the sequence conditions and the frequency conditions. This interaction suggests feature frequency is a potential variable in explaining the conflicting results between the psychological research supporting the use of all positive instances and the educational research supporting the use of mixed positive and negative instances.

Secondary analysis of student errors suggests the importance of using both positive and negative instances in the evaluation of a student's knowledge of features and concepts.

## PERFORMANCE OF A TACTUAL DISCRIMINATION TASK BY SECOND, FOURTH, SIXTH, AND EIGHTH GRADE STUDENTS UNDER TWO CONDITIONS OF HEMISPHERIC INFORMATION PROCESSING

Order No. DA8300381

WOLFE, DEBORAH ANITA, PH.D. *The Ohio State University*, 1982. 196pp. Adviser: Professor Jacqueline H[illegible]rkowitz

Eighty right-handed children were selected from grades 2, 4, 6, and 8 to assess haptic information processing. Each student was administered two tests. The first test was a haptic discrimination task in which the student was asked to haptically identify two out of three shapes that matched. The test was performed with the subject's hands inside a box. The second test was a haptic and auditory test. In this test, the subject performed the same haptic test in addition to responding orally by subtracting "1" from a series of numbers heard over headphones. There were fourteen 15 second trials in each test.

Two factorial analyses of variance were performed on the data. In the first analysis, the main effects for grade level, modality, and hand were significant beyond the .05 alpha level in the analysis of variance in which haptic performance scores were the dependent variables and modality, grade level, sex and hand were independent variables. Grades 6 and 8 scored significantly higher than grades 2 and 4 during haptic test performance. The left hand performance proved significantly better than the right hand during haptic task performance.

In the second analysis, the main effect of grade level and the interaction effect of grade level and sex during hemispheric information processing were significant beyond the .05 alpha level in the analysis of variance in which haptic performance scores were the dependent variables and hemispheric information processing, grade level, and sex were the independent variables. Haptic performance of grades 6 and 8 were found to be significantly better than grades 2 and 4 during hemispheric information processing.

The present findings support the theory of Gescheider, Sager, and Ruffolo (1975) that when cognitive processing is increased under dual-task performance, disruption of information processing occurs resulting in decrement of performance.

### COGNITIVE STYLES, AFFECTIVE TRAITS, AND ACADEMIC SUCCESS MEASURES AS SETS OF VARIABLES IN COLLEGE STUDENTS

Order No. DA8300812

**WOLFE, WAYNE ANTHONY, PH.D.** *Indiana University*, 1982. 174pp.
Chairperson/Director: Dr. Thomas M. Schwen

Cognitive style research came on the educational scene in the 1970's as a potential aid for individualized instruction. However, very little research attempted to examine a variety of styles in relationship to other learner variables traditionally associated with individual differences.

This study used canonical correlation to investigate the relationship among sets of variables associated with individual differences--cognitive styles, affective or social traits, and measures of academic success. The styles were field dependence-independence, constricted-flexible control, category width, conceptual differentiation, compartmentalization, conceptualizing style, leveling-sharpening, and cognitive complexity-simplicity. The California Psychological Inventory assessed affective traits. Academic success variables were ranked in high school class, SATM, SATV, and first semester college grade point average.

Royce's theory of individuality and Witkin's research on field dependence-independence provided the framework necessary to investigate style, affective, and academic success variables. Eight sets of relationships were examined: (1) styles with affective traits, (2) styles with interpersonal traits, (3) field dependence-independence measures with interpersonal traits, (4) field dependence-independence measures with affective traits, (5) styles with academic success, (6) field dependence-independence measures with academic success, (7) academic success with affective traits, and (8) academic success with affective traits. All results were replicated and cross-validated.

The results of the study do not substantiate the alleged pervasive influence of cognitive styles. Twenty-five years of speculation by cognitive style researchers that the influence of cognitive styles extends to virtually all activities that involve cognition, particularly affective traits and interpersonal functioning, should be dispelled. Replication and cross-validation confirmed only two of the six significant canonical correlations among the eight relationships examined. While replicated and cross-validated significant correlations were found between the cognitive style set and the academic success set and between the field dependence-independence set and the academic success set, these results simply verified that field dependence-independence and SATM have a strong relationship to each other. The results also established that the eight cognitive styles were independent of each other.

### A CORRELATION STUDY VALIDATING A TEACHER ASSESSMENT INSTRUMENT WITH ACHIEVEMENT SCORES OF SPECIAL EDUCATION STUDENTS

Order No. DA8317523

**WOODRUFF, DIANA LEMKE, PH.D.** *Georgia State University - College of Education*, 1983. 115pp.

*Purpose.* An instrument developed by the personnel of the Dekalb County School System is used in all areas of education to measure teacher competency. There was a need for this instrument to be validated for the field of special education.

One of the major concerns of teachers and administrators is to determine factors that are considered necessary for effective teaching. The purpose of this study was to determine the relationship between classroom teacher behavior and pupil learning gains using teacher-developed criterion-referenced tests. The study examined the ways in which categories of teaching performance corresponded to the production of pupil learning over eight weeks of instruction.

*Methods and Procedures.* In order to investigate the relationship, special education teachers with one or more years of experience were randomly selected from 80 elementary schools. The sample consisted of 34 special education teachers in behavior disorders who were teaching elementary resource from grades four through seven. They were further grouped into high socioeconomic status or low socioeconomic status. The TPOR was administered by trained data collectors on two different observation sessions during the instructional unit of reading and mathematics. Pupils were administered the criterion-referenced level tests in reading and math at the beginning and the end of the 8-week period of this study. The same test was used for pre- and post-testing.

The Pearson Product-Moment Correlation was used to compute the relationship between the instructional effectiveness index of the TPOR and student gain scores. A multiple regression procedure was used to determine variables which could best predict post-test scores in reading and/or math.

*Results.* After the data were analyzed, it was found that no significant relationship at the established criterion level existed. The null hypothesis of no significant differences could not be rejected.

*Conclusion.* This study failed to validate the instruments ability to measure effective special education teachers based on student gain scores. In addition, the instrument does not appear to differentiate between teachers whose students showed a loss in achievement.

### A STUDY OF THE FACTORS RELATING TO ADMISSION AND ACADEMIC ACHIEVEMENT OF FEMALE STUDENTS IN THE COLLEGE OF EDUCATION, MECCA, SAUDI ARABIA

Order No. DA8313983

**YASEEN, NAWAL HAMED, ED.D.** *University of Northern Colorado*, 1983. 126pp.

*Purpose of the Study.* The purpose of this study was to determine the relationship of science scores and math scores on the Public Secondary Examination, as well as age groups and place of residency, to academic achievement in science and math in the College of Education, Mecca, Saudi Arabia, for female students.

*Procedures.* The population for this study was a random sample of 354 female college students from the Mathematics Department and Science Department, Umm-Al-Kura University. The data were examined to determine if correlations existed between age and place of residence; scores in math, biology, chemistry, and physics on the Public Secondary Examination; and college grades achieved in math, biology, chemistry, and physics and college science-math GPA's for each student. Frequency distribution, simple correlation coefficient, and Multiple Linear Regression were applied to analyze the data.

*Results and Conclusions.* (1) With the exception of female freshmen biology majors, all the null hypotheses, including those relating to age and place of residence, were rejected at the freshman, sophomore, and junior/senior levels for math majors and science majors. (2) Significant positive relationships existed between the following in all college levels: (a) math scores and math grades; (b) chemistry scores and chemistry grades; (c) physics scores and physics grades; and (d) biology scores and biology grades (except for freshmen biology). (3) No relationship was found between biology scores and (a) college biology grades and (b) college science-math GPA's for freshmen biology majors. (4) Science scores and math scores were found to be good predictors for college academic achievement in math and science with one exception, for freshmen biology majors. (5) Twelfth grade science-math GPA's were found to be a better predictor of college achievement than individual math scores or science scores earned on the Public Secondary Examination.

Based on these conclusions, a recommendation was made to enhance the quality of the admissions system and to support qualified students' opportunities, as well.

### INTERRUPTIVE SCHOOL ATTENDANCE AND ACADEMIC ACHIEVEMENT OF ELEMENTARY SCHOOL STUDENTS

Order No. DA8229642

**YIM, GLORIA Y., ED.D.** *United States International University*, 1982. 113pp. Chairperson: Dale G. Hamreus

*The Problem.* This study investigated the effects of mobility on five areas of academic achievement: (1) school district's achievement rating; (2) academic achievement of elementary school students; (3) classroom environment, (4) academic continuity of students, and (5) social development of students.

*Method.* The final sample was composed of thirty-three teachers of sixth graders as well as the 203 students of nine classrooms which were randomly selected from the total of thirty-four sixth grade classrooms of Oceanside School District, California. A Chi-Square test was employed to determine if there was a relationship between the mobility students and the low achievement rating of Oceanside School District. A Pearson Product moment correlation coefficient was computed to determine if the achievement test scores in reading and mathematics on the Comprehensive Test of Basic Skills of mobile students are significantly different from those of nonmobile students. Teacher Questionnaires were used to explore the level of classroom disruption stemming from the mobility student factor. Student Questionnaires were used to examine both the level of academic discontinuity and the level of social acceptance experienced by mobile students.

*Results*. All statistical hypotheses were tested at the .05 level of confidence. The Chi-Square value of 46.2 with 1 degree of freedom revealed that the mobility student factor was significantly related to the school district's low achievement rating. The Pearson product moment correlation coefficients between moving and reading was -.46. The correlation coefficient between moving and mathematics achievement was -.42. Therefore, for both reading and mathematics, the level of negative correlation between the number of schools attended and academic achievement was significant.

Teacher questionnaires revealed that the teachers experienced disruptive classroom environment due to newly arriving students during the year. Student questionnaires revealed that the mobile students experienced general loss of instructional continuity. No conclusive evidence was shown regarding the influences of mobility on negative social acceptance.

### AN INVESTIGATION OF THREE ARITHMETIC PROGRAMS IN THE DEVELOPMENT OF BASIC ARITHMETIC SKILLS OF SPECIFIC LEARNING DISABLED FOURTH, FIFTH, AND SIXTH GRADE STUDENTS Order No. DA8311090

Yim, Roger (Ki-Song) Ph.D. *University of Southern Mississippi*, 1982. 93pp.

The purpose of this study was to determine the effects of specific arithmetic programs on the achievement test scores among groups of specific learning disabled students. The subjects comprised a sample of 79 specific learning disabled fourth, fifth, and sixth grade students selected from three school districts in Mississippi during the 1981-82 school year.

The Experimental Group One (N = 26) was taught with the Auditory/Teacher-made Program while the Experimental Group Two (N = 28) was taught with the Programmed Math. The Control Group (N = 25) was taught with the Adopted Arithmetic Program. Each group received treatment for 10 weeks.

The test selected for use in this study was the California Achievement Test and Teacher-made test. Three administrations were given as a pretest, mid-term test, and posttest.

The results of this study indicated that the three selected arithmetic programs did not appear to affect the achievement test scores, differentially, of the specific learning disabled students used in this study. There were statistically significant gains between the pretest scores and the posttest scores. It would appear that a planned program focusing on major learning deficit areas was more important that the type of curricula programs.

### TIME FOR COMPLETION OF ARITHMETIC COURSE AS PREDICTOR OF SUCCESS IN FOLLOW-UP ELEMENTARY ALGEBRA COURSE Order No. DA8313513

Young, Eleanor Shafer, Ed.D. *University of Cincinnati*, 1982. 61pp.

In order to determine if there is a direct relationship between time needed for learning and achievement in a subsequent learning experience, time for completion in one course was investigated as a possible indicator of success in a follow-up course. The hypothesis was projected that the length of time needed to complete a remedial arithmetic course would have a negative correlation with the grade earned in the follow-up elementary algebra course. Two-year college students entering an 80% mastery-level, self-paced remedial arithmetic course by placement test recommendation were tracked. The original task was defined as the number of weeks required to complete the arithmetic course which allowed students to reach mastery over a two-term interval, if needed. This time in weeks became the independent variable. Students who completed the arithmetic course during the term selected for the study and then entered a follow-up elementary algebra course the next term (the succeeding task) became subjects for the study. Grade in follow-up course was designated as the dependent variable. Calculation of a correlation coefficient between time in weeks to complete the arithmetic course and grade in the follow-up elementary algebra course yielded a Pearson "r" of -.36 which, for 75 subjects included in this study, shows significance at the .001 level. Thus, as hypothesized, students who completed the original learning task in less time were statistically more likely to earn a satisfactory grade in the next math course. If data were collected for a similar situation, it would be possible to produce a regression equation specific for that particular case that would enable prediction of success in a follow-up course. Such information would be useful in counseling for career decisions as well as selection of follow-up course according to instructional format preferred by student.

### THE RELATIONSHIP OF COGNITIVE MEASURES TO AFFECTIVE SCALES FOR A SAMPLE OF GIFTED AND HIGHLY GIFTED PUPILS IN MAGNET AND NON-MAGNET ELEMENTARY SCHOOLS

Zarnegar, Zohreh Tahereh, Ph.D. *University of Southern California*, 1983. Chairman: Professor William B. Michael

*Problem*. Among gifted pupils who are progressing through elementary school, the relationship of their level of cognitive functioning both in the mastery of basic skills and in the manifestation of creative behaviors to affective characteristics should be of interest to educators who are endeavoring to understand the complexities of psychological constructs underlying the learning processes of the gifted and to plan accordingly appropriate instructional strategies to maximize the realization of the potentialities of exceptionally talented children during their formative years. For a total sample of 315 gifted pupils (184 boys and 131 girls) in grades 4, 5, and 6, who had been differentiated by highly gifted vs. gifted status and by placement in a magnet or non-magnet school, three major purposes of this investigation were: (1) to determine the degree of relationship of two standardized achievement tests in reading and mathematics and of four originality tasks to each of ten affective measures including six of academic self-concept, three of locus of control, and one of general adjustments to the school setting; (2) to ascertain differences in average standing of subgroups of pupils differentiated by sex, grade level, gifted status, and school placement on each measure; and (3) to identify cognitive and/or affective variables that would differentiate high achievers from low achievers in reading and mathematics.

*Data analyses*. In addition to calculation of intercorrelations among all variables, analyses of variance and multiple discriminant analyses were completed.

*Findings and Conclusions*. (1) As the highest correlation between any cognitive and affective variable was only .18 little, if any, relationship exists between cognitive and affective measures (perhaps largely because of restriction in range of talent). (2) Among the various differentiated subgroups, few statistically significant and virtually no practically significant differences are evident in average levels of standing on any dependent variable. (3) A modest degree of promise appears for one originality measure, two academic self-concept scales, and a school adjustment form in differentiating potential high achievers from low achievers among gifted pupils in reading performance; only a school adjustment measure displays potential predictive value relative to mathematics achievement.

## ABSTRACT THOUGHT AS A COMPONENT OF COMPUTER PROGRAMMING

Order No. DA8319952

ZBYSZYNSKI, HENRY MICHAEL, ED.D. *Boston University School of Education*, 1983. 162pp. Major Professor: J. Franklin Fitzgerald

*Problem Statement*. The purpose of this study was to examine the cognitive background or heuristics of students and to relate these heuristics to success with computer programming. Programming knowledge was described as a combination of semantic and syntactic knowledge. Semantic knowledge is composed of processes or heuristics that aid in solving problems. Syntactic knowledge is detailed information about a particular programming language. The separation of variables, the use of direct/inverse proportions, the use of combinations, the use of permutations, the use of probability, the use of deductive and propositional logic were identified as specific heuristics comprising semantic knowledge.

The hypotheses to be tested were the following; that performance on some combination of the eight heuristics tested were related to programming ability and that these eight heuristics were more closely related to programming ability for students who do very well or very poorly on the heuristic items than for those that scored in the middle range.

*The Procedure*. A test of eight items, one for each heuristic, was administered to students enrolled in a college programming course. Also, a test of achievement was given at the end of the course. A correlational study was done to establish the relationship between the results of the heuristic item evaluation and programming achievement.

*Findings*. The study found that the heuristic test explained 30.8% of the variance of the programming achievement scores. A subset of the heuristics which included direct proportions, propositional and deductive logic, permutations and correlations described 30.5% of the variance. Using only students who scored in the upper and lower groups of the heuristics test, the relationship was stronger as indicated by this model explaining 42.5% of the variance.

*Conclusions*. The study indicates that if a student who is beginning a programming course has not yet achieved proficiency in the use of the specific heuristics tested that this student is not likely to do well in that introductory course.

## THE EFFECT OF SELECTED EVENTS OF INSTRUCTION ON STUDENT MASTERY OF A MATHEMATICS RULE

Order No. DA8309287

ZEH, BRENDA SUE, PH.D. *The Florida State University*, 1982. 121pp. Major Professor: Walter W. Wager

The purpose of this study was to investigate the relationship between the number of selected events of instruction included in an instructional program and the proportion of students reaching mastery of the rule for dividing mixed fractions.

Seventy students from fifth through eighth grades who scored 80% or higher on an entry test and below 80% on a pretest were stratified by grade and sex and randomly assigned to the treatment groups. Group 1, the control group, received a statement of the objective, the stimulus, and assessment. Groups 2, 3, and 4, the experimental groups, received the successively added independent variable events of providing learner guidance, stimulating recall of prerequisite skills, and practice and feedback. The dependent variables were the proportion of students who scored 80% or better on the posttest, which was given immediately following the treatment, and the retention test, which was administered one week following the treatment.

Chi-square analysis of the data revealed no differences among the groups on either the posttest or retention test. Further analysis revealed no differences in performance across treatments or within any particular treatment groups due to sex or grade of the subjects. The sequential addition of learner guidance, recall of prerequisite skill, and practice and feedback to instructional programs did not ffect the proportion of students who reached mastery of the rule for ividing mixed fractions.

## SOLVING LINEAR EQUATIONS ON A MICROCOMPUTER: THOUGHT PROCESSES, ERRORS, AND GUIDANCE

Order No. DA8309221

ZIELKE, DONALD HENRY, PH.D. *The University of Texas at Austin*, 1982. 207pp. Supervisor: Ralph Cain

This study was designed to determine the types of thought processes used, the types of errors made, and the amount of guidance needed by college students who solved linear equations by the Trial Evaluation Method or the Substitution Method--procedures specifically developed for solving linear equations using the TI 99/4 Home Computer.

Twelve subjects were randomly selected from each of two different lower level college mathematics classes at a small Lutheran college. Each subject received training in using the Trial Evaluation Method and the Substitution Method by attending a one-hour general training session and a small group training session. At the end of the general training session each subject was randomly assigned to one of four different method-guidance groups. Each subject's work and comments in solving one or more of six linear equations were recorded on a one-hour video cassette and then transcribed.

Major findings of the study were: (1) subjects used almost as many sequential and deliberate thought processes as they did judgmental and knowledge in other forms combined; (2) low-ability subjects used more judgmental and knowledge in other form thought processes than did high-ability subjects; (3) approximately one-third of the subjects' errors were execution, one-third pieces of procedures, one-fourth computer-caused, and the remainder symbol manipulation; and (4) low-ability subjects made more execution, pieces of procedures, and symbol manipulation errors than did high ability subjects.

The major conclusions were: (1) subjects tended to be unable to describe what they were doing as they solved linear equations; (2) subjects seemed to have a partial knowledge of vocabulary, procedures for solving linear equations, basic rules of algebra, how to manipulate symbols, and checking procedures; (3) subjects who solved equations by the Trial Evaluation Method were able to identify and correct only a small percentage of their errors with computer guidance alone; and (4) different ability-level subjects, subjects who used different methods of solving linear equations, and subjects who received different levels of guidance tended to use different thought processes, tended to make different kinds of errors, and tended to require different amounts of guidance.

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| Nuzum | E |
| Perunko | C |
| Roth | E |
| Rycek | C |
| Shipstead | E |
| Shoemaker | S |
| Stone | E |
| Sullenberger | S |
| Swoope | S |
| Tamburino | E |
| Truckson | C |
| Vasquez | S |
| Wilcox | E |

## Programmed Instruction

| | |
|---|---|
| Liu | S |
| Schielack | E |
| Shine | C |

## Quantitative Concepts in Other Curricular Areas

| | |
|---|---|
| Baker | C |
| Bennett | C |
| Dettloff | C |
| Luisser | C |
| Ortiz | E |
| Peeples | S |
| Perreault | S |
| Simon | C |
| Zbyszynski | C |

## Quantitative Understanding

| | |
|---|---|
| Miller, Kevin | E |
| Rin | C |

## Ratio, Proportion, and Percent

| | |
|---|---|
| Fajemidagba | S |
| Fisher | S |
| Maxim | S |
| Noll | C |

## Readiness

| | |
|---|---|
| Bonner | E |
| McDermit | E |
| Meeks | E |
| Webb | E |

## Reinforcement

| | |
|---|---|
| Berkaman | S |
| Brunson | S |
| Clark | E |
| Frye | C |
| Maurer | E |
| Noll | C |
| Tiu | E |
| Zeh | E/S |

## Remediation

| | |
|---|---|
| Alberding | C |
| Alfred | E |
| Bedi | E |
| Buscavage | E |
| Clark | E |
| Frye | C |
| Hathaway | S |
| Haus | S |
| High | E/S |
| Jones | E |
| Whitney | E/S |

## Retention

| | |
|---|---|
| Gailey | E |
| Horine | E |
| Leyton Soto | S |

## Review

| | |
|---|---|
| Reed | C |
| Reid | S |

### Sex Differences

| | |
|---|---|
| Ast | S |
| Baker | C |
| Ben-Haim | E/S |
| Berkovitz | C |
| Blake | C |
| Curtin | S |
| Edelman | - |
| Exezidas | E/S |
| Fee-Fulkerson | C |
| Halderman | E |
| Janes | S |
| Johnson, M.A. | C |
| Kaczala | E/S |
| Knopp | C |
| Kronberger | C |
| Lilly | E/S |
| Ling | C |
| Moller | S |
| Moylan | S |
| Perunko | C |
| Pogatshnik | S |
| Prillwitz | C |
| Rapoport | E/S |
| Sass | E/S |
| Siegel | C |
| Smedlaw | E |
| Thomas, D. | E/S |
| Tohidi | E/S |
| Verbeke | S |
| Ware | E/S |
| Yaseen | C |

### Socioeconomic Factors

| | |
|---|---|
| Bujan-Delgado | E |
| Donovan | E |
| Fremouw | S |
| Gates | E |
| Halderman | E |
| Long | E |
| Maddocks | E |
| Maurer | E |
| Slater | E |

### Spatial Visualization

| | |
|---|---|
| Cramond | S |
| Hass | - |
| Johnson, M.A. | C |
| McKee | S |
| Perunko | C |
| Verbeke | S |
| Ware | E/S |

### Summaries and Reviews

| | |
|---|---|
| McEvoy | E/S |
| Phillips | E |
| Tohidi | E/S |

### Teacher Background

| | |
|---|---|
| Curtin | S |
| Forster | E |
| Garza-Buentello | E |
| Hathaway | S |
| Hazlett | E |
| Heidenreich | E |
| Jeffreys | E/S |
| Lulow | E |
| Mehdikhani | C |
| Reynolds | E |
| Simon | E/S |
| Spires | E |
| Thompson, A.R. | E |
| Weisbeck | S |

### Teacher Education: Inservice

| | |
|---|---|
| Curtin | S |
| Darnell | S |
| Edens | E |
| Fisher | S |
| Forster | E |
| Garza-Buentello | E |
| Gohs | S |
| Hativa | C |
| Heidenreich | E |
| Lulow | E |
| McGalliard | S |
| Pratt | S |
| Ross | C |
| Ryoo | S |
| Spires | E |
| Stenzel | E/S |
| Stomper | C |
| Thomas, B. | E |
| Thomas, D. | E/S |
| Thompson, A.G. | S |
| Ware | E/S |
| Watson, C. | S |
| Weisbeck | S |
| Williams | E |
| Willson | E |

### Teacher Education: Preservice

| | |
|---|---|
| Bush | S |
| Dallman | S |
| Dennis | E |
| Schielack | E |
| Shearn | E |
| Sonnabend | E |
| Thompson, A.J. | S |

### Teaching Approaches

| | |
|---|---|
| Casper | E |
| Crenshaw | E |
| Darch | E |
| Dews | E |
| Fenigsohn | S |
| Ferro | S |
| Flanagan | E |
| Friske | S |
| Gohs | S |
| Grinstead | E |
| Harsher | S |
| Harvey | E |
| Higab | S |
| Hurley | C |
| Johnston, M. | E |
| Kasilus | S |
| Layton Soto | S |
| Mosely | E |
| Owen | E |
| Peters | S |
| Pratton | E |
| Reed | C |
| Reid | S |
| Saab | E |
| Sacks | E/S |
| Schielack | E |
| Shearn | E |
| Shine | C |
| Sigda | E |
| Smedley | E |
| Smith, T. | C |
| Stanford | S |
| Stucker | E |
| Thompson, T.J. | C |

### Teaching Approaches (continued)

| | |
|---|---|
| Watson, J. | C |
| Weinberg | E |

### Test Analysis

| | |
|---|---|
| Abbate | E |
| Blake | C |
| Ferguson | C |
| Golub-Smith | E |
| Henry, P. | S |
| Keefe | E |
| Ling | C |
| Moore, J. | S |
| Robinson | C |
| Steele | E |
| Walker | E/S |
| Wilmot | E |
| Woodruff | E/S |

### Testing

| | |
|---|---|
| Alberding | C |
| Brimlow | C |
| Dallman | S |
| Kim | E |
| Maspons | C |
| Miller, Kelly | - |
| Urman | E |

### Textbooks

| | |
|---|---|
| Al-Saloom | E |
| Hartzler | S |
| Mateja | E |
| Smalley | S |
| Speck | S |
| Stucker | E |

### Thought Processes

| | |
|---|---|
| Burzler | E/S |
| Cramond | S |
| DeGuire | - |
| Doll | E |
| Eskstrand | E/S |
| Fajemidagba | S |
| Friel | S |
| Garofalo | E |
| Koh | E/S |
| Moylan | S |
| Perez | C |
| Rycek | C |
| Shipstead | E |
| Spraings | E/S |
| Stout | - |
| Thompson, T.J. | C |
| Tirre | E |
| Wilson | S |
| Wolfe, D. | E/S |
| Zbyszynski | C |
| Zielke | C |

### Time Allotment

| | |
|---|---|
| Buscavage | E |
| Daniele | E/S |
| Goiran | S |
| Jones, W. | E |
| Maddocks | E |
| Martin, M.K. | E |
| Oldham | E/S |
| Pelfrey | S |
| Roth | E |
| Smith, G. | S |
| Virostko | E |
| Whitney | E/S |
| Yim, G. | E |
| Young | C |

### Transfer

| | |
|---|---|
| Wilcox | E |

### Trigonometry

| | |
|---|---|
| Bone | S |
| Collenback | S |

### Tutoring

| | |
|---|---|
| Alberding | C |
| Franca | E/S |
| Kinney | E |
| Lindskog | E |
| Peters | S |

### Value and Uses of Mathematics

| | |
|---|---|
| Loase | S/C |
| Luisser | C |
| McGalliard | S |
| Thayer | C |

### Whole Number Computation (Several Operations)

| | |
|---|---|
| Garofalo | E |
| Gill | E |
| Golden | S |
| Haus | S |
| James | E |
| Langbort | E |
| Lindskog | E |
| Marshall | E |
| Owen | E |
| Shipstead | E |
| Shoemaker | S |
| Speck | S |
| Watson, C. | S |

### Whole Number Computation: Addition

| | |
|---|---|
| Aviv | E |
| Breault | E |
| Dews | E |
| Dudley | E |
| Garofano | E |
| Owen | E |
| Tanbanjong | E |

### Whole Number Computation: Subtraction

| | |
|---|---|
| Aviv | E |
| Breault | E |
| Clark | E |
| Dews | E |
| Dudley | E |
| Garofano | E |
| Parra | E |
| Quam | E |
| Rickman | E |
| Tanbanjong | E |

### Whole Number Computation: Multiplication

| | |
|---|---|
| Darch | E |
| Foster | E |
| Gailey | E |
| Regan | S |
| Sigda | E |
| Tiu | E |
| Willott | E |

### Whole Number Computation: Division

| | |
|---|---|
| Darch | E |
| McDermit | E |

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